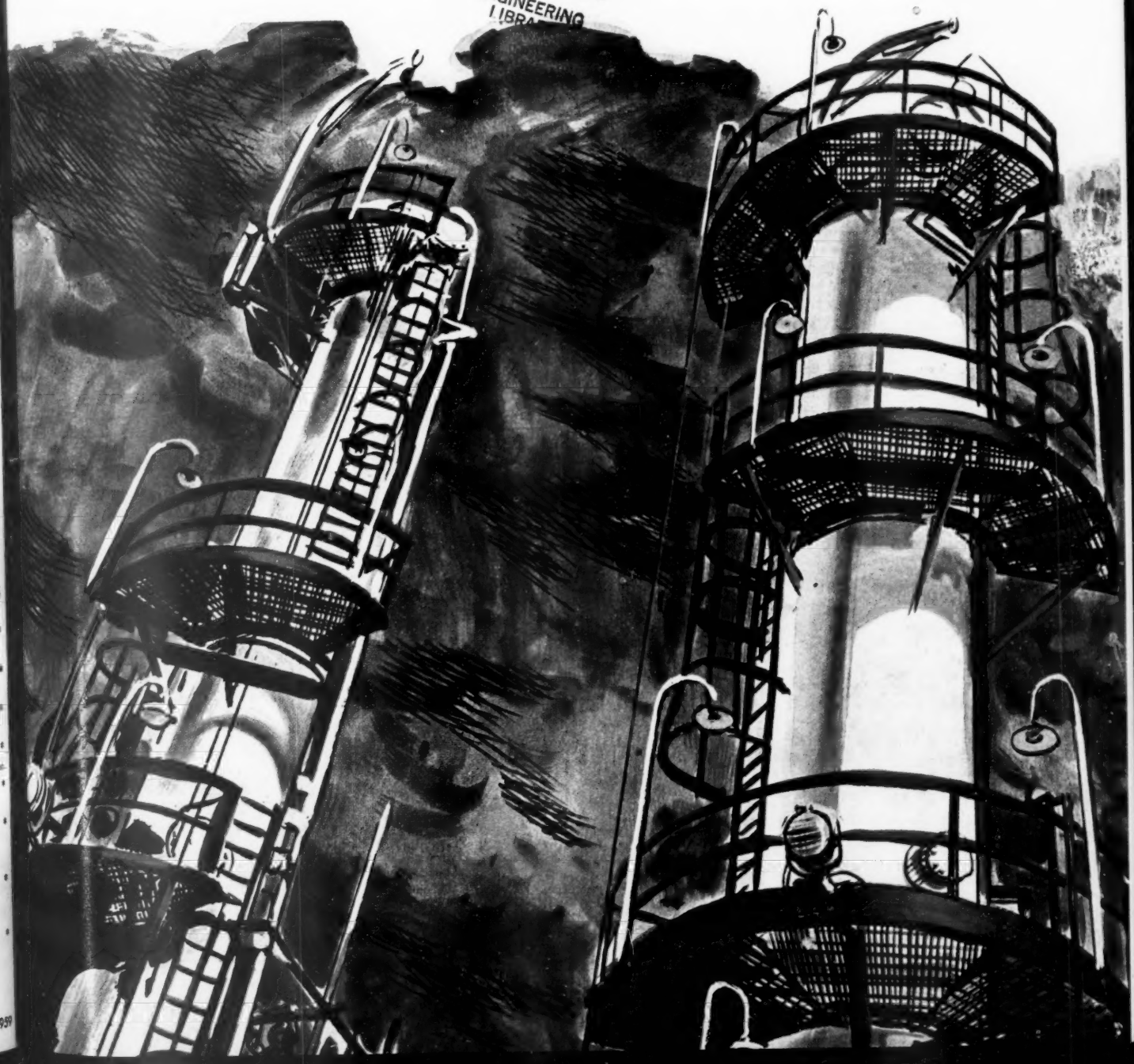
AIR ENGINEERING

DECEMBER, 1959

AIR POLLUTION CONTROL • AIR MOVING • AIR CONDITIONING

- *How To Evaluate Paint Spray Booths*
- *Top Management Looks At Air Pollution*
- *Fundamentals of Dust Collection*
- *Techniques for Designing Duct Systems*
- *Specifications—Open, Closed, or Base Bid?*

THE UNIVERSITY OF MICHIGAN
DEC 22 1959
ENGINEERING LIBRARY



A new kind of practical engineering publication . . . dedicated to design, application, selection, installation and operation of equipment used in the engineering of air

AIR ENGINEERING

Check this chart to see how Air Engineering's circulation covers the air conditioning, air moving, and air pollution control markets

If you sell air moving equipment, industrial air conditioning equipment, or air pollution control equipment, use AIR ENGINEERING to influence these industry groups:

1. AIR ENGINEERING is read by over 6,000 Air Engineers and other executives in America's largest industrial organizations . . . the men who make decisions to buy!

2. AIR ENGINEERING reaches and influences over 2,300 Consulting Engineers, Architects and Mechanical Contractors . . . the men who design, specify and install equipment.

3. AIR ENGINEERING reaches over 1,700 code enforcement authorities, industrial hygienists, medical researchers and industrial engineering departments . . . the men who are constantly working to improve atmospheric conditions.

This adds up to a concentrated, specialized readership of over 10,000 men directly concerned with the increasingly complex problems of air.

By advertising in AIR ENGINEERING your product is studied by these men directly . . . and you reach them at a time when AIR ENGINEERING's editorial content is making them most aware of air problems. These are the men who are going to be the most vital influences in a growing market. Sell them on your product now!

CONTACT YOUR NEAREST REPRESENTATIVE for Market and Media File, full information and space reservations.

NEW YORK: MUrray Hill 2-1928-9
CHICAGO: FRranklin 2-8093
LOS ANGELES: AXminster 2-9501
DETROIT: WOodward 2-0924

PUBLISHED MONTHLY
CIRCULATION GUARANTEED 10,000

B = BUYERS
S = SPECIFIERS
R = RECOMMENDING OR APPROVING

	ENGINEERS IN INDUSTRIAL PLANTS, BUILDINGS, INSTITUTIONS	CONSULTING ENGINEERS AND ARCHITECTS	FEDERAL, STATE AND MUNICIPAL AUTHORITIES	EQUIPMENT MANUFACTURERS AND THEIR SALES OUTLETS	MECHANICAL CONTRACTORS
FANS AND BLOWERS	B	S	R	B	B
AIR FILTERS	B	S	R	B	B
AIR CONDITIONING EQUIPMENT	B	S	R		B
VENTILATORS AND EXHAUSTERS	B	S	R		B
STOKERS, BURNERS, ETC.	B	S	R		B
STACKS, CHIMNEYS	B	S	R		B
ODOR NEUTRALIZERS	B	S	R		B
CATALYTIC PURIFIERS	B	S	R	B	B
INCINERATORS AND WASTE BURNERS	B	S	R		B
GERMICIDAL RADIATION	B	S	R	B	B
DUST COLLECTORS	B	S	R		B
AIR WASHERS AND SCRUBBERS	B	S	R		B
SOLVENT RECOVERY SYSTEMS	B	S	R		B
FUME COLLECTORS	B	S	R		B
CONTROLS	B	S	R	B	B
TEST APPARATUS		B	B	B	B
ELECTRONIC AIR CLEANERS	B	S	R		B
DUCT WORK AND ACCESSORIES	B	S	R		B

FOR THESE INDUSTRIES

METALLURGICAL • NUCLEONICS • TEXTILES

FOODS • TRANSPORTATION • MINING • CHEMICAL

UTILITIES • PETROLEUM • METAL PRODUCTS

. . . or wherever air treatment or air control problems exist

BUSINESS NEWS PUBLISHING CO. FOUNDED 1936. 450 WEST FORT ST., DETROIT 26, MICH.

DAY

EQUIPMENT FOR INDUSTRY

LOW COST, EFFICIENT

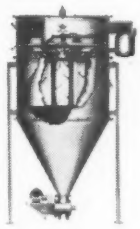
Dust Control

More and more leading companies are depending on DAY for complete dust control service. DAY can recommend and engineer a complete dust control system for the needs of any industrial plant.

Photo at right shows three DAY Type "AC"* Reverse Jet dust filters with weather-proof housing located on the roof of a rubber company. The DAY "AC" filter is the largest selling filter of its type in the world. Its low maintenance cost and high efficiency are two of the many reasons why it is so popular.

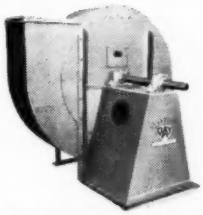
For complete information write for Bulletin F-75.

* Licensed by H. J. Hersey, Jr.



Type "RJ" * Dust Filter — Highly efficient, combination cyclone and filter. Write for Bulletin G-579.

"HV" Dust Separator — A heavy gauge, welded, highly efficient centrifugal dust separator. Write for Bulletin 576.

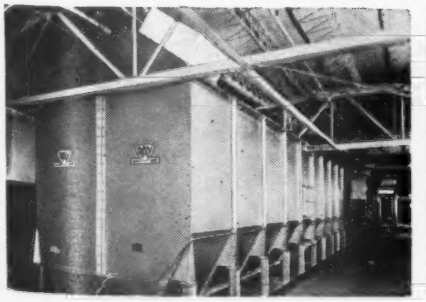


Type "G" Fans — Statically and dynamically balanced; designed principally for dust control applications. Write for Bulletin I-585.

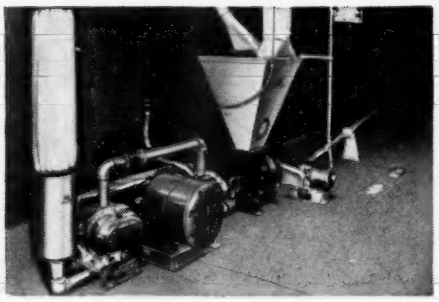
Dual-Clone Dust Separator — Exclusive design gives high efficiency at low resistance. Write for Bulletin 573.

Unit Dust Controllers — Complete, low cost unit combines high efficiency of Dual-Clone and Exhauster. Write for Bulletin 510.

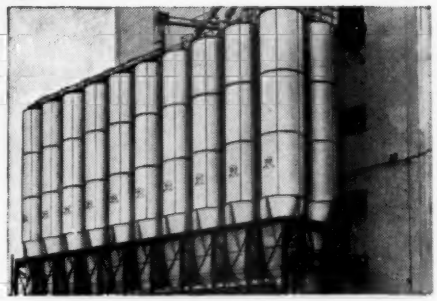
Money-Saving Bulk Material Storage and Handling



A two-section DAY horizontal tank installed in a Canadian plant. Pneumatically loaded and mechanically unloaded. Note air relief on top of tank.



DAY pneumatic conveying systems improve plant efficiency. Installation pictured above required two pumps in series because of long (250 feet) run.



Twenty DAY tanks (above) installed at a large Midwest plant. Tanks serve packaging line as well as truck, railcar loading operation. Each tank holds approximately 20 tons of product.

What's Behind the Swing to DAY Bulk Material Storage and Handling? Many plants with DAY equipment save up to 35¢ on every 100 pounds of material handled. DAY equipment is also safer, cleaner and more efficient than manual material handling. DAY bulk equipment can be installed anywhere. It is completely sanitary and weather-proof. Find out how much money your plant can save when it is equipped with DAY products for handling and storing bulk materials. For latest information write toDAY for Bulletins M-588 and 574.

Write for name of your nearest DAY application engineer. He will help you with any dust control or bulk material equipment problem. This service is offered without cost or obligation.

The **DAY** *Company*

SOLD in UNITED STATES by
The DAY SALES Company
868 Third Avenue N.E.
Minneapolis 13, Minnesota

MADE and SOLD in CANADA by
The DAY Company of Canada Limited
Rexdale (Toronto), Ontario, Canada
Ft. William, Ontario, Canada

Representatives in Principal Cities

Just How Clean is clean Air ?

How clean must the air be in Commercial and Industrial Air Conditioning Systems

How can the specific clean air requirements be achieved in–

Hospital Operating Rooms
Computer Ventilating Systems
Process Exhaust Systems
"Dust-Free" Rooms

. . . and what is the POSITIVE, low-maintenance way to get it

YOU'LL FIND MANY HELPFUL SUGGESTIONS IN BULLETIN 121

Write Today for Your FREE Copy . . .

Cambridge Filter Corporation
744 E. Erie Blvd., Syracuse 1, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

Letters

Contaminant Guide

Editor:

I will appreciate information regarding the availability of reprints of the "Engineer's Guide to Industrial Contaminants" which appears in the August issue of AIR ENGINEERING on pages 17-19. It's an excellent compilation, and very useful.

S. M. Belth
Principal Chemist
City Health Department
Baltimore, Md.

Editor's note: *Reprints of "Engineer's Guide to Industrial Contaminants" are available at 15 cents each for one to nine copies and 10 cents each for 10 or more copies.*

Hospital Air Sanitation

Editor:

All workers in the field of AIR ENGINEERING must appreciate your efforts to cover in one publication this increasingly important branch of modern technology.

AIR ENGINEERING should be particularly helpful to plant engineers and designers in need of practical information not readily found in lengthy research reports.

Your editorial on Hospital Air Conditioning is outstandingly to the point, and when translated into action, would save many lives.

E. K. Von Brand
Industrial Hygienist
Hopewell Junction, N. Y.

Editor:

AIR ENGINEERING has fulfilled all my expectations. I believe it is the ultimate in the field of air pollution, control, moving, and conditioning. I shall look forward to each new issue eagerly.

Merlin W. Zook
State College, Pa.

Editor:

The attractive and informative September, 1959 issue of your publication AIR ENGINEERING reached our office just recently. You will readily recognize our interest in this publication, since direct gas fired heating of air-in-motion has been one of the major specialties of the Maxon Premix Burner Co.

(Please turn to page 4)

AIR ENGINEERING

VOL. 1, NO. 9 DECEMBER, 1959

DEDICATED TO THE SCIENCE OF AIR POLLUTION CONTROL
AIR MOVING • AIR CONDITIONING

FEATURES

How To Evaluate Paint Spray Booths 20
Ford Motor Co. industrial hygienists tell how to pretest booths

Reverse Jet Filters Solve Grain Loading Problem 25
Minneapolis grain elevator tells how filters stopped dust

Techniques For Designing Duct Systems 27
Part II gives data for determining air flow resistance in ducts

Survey Of Air Cleaning Equipment Market 30
Survey of only 12 cities, one county, shows $498-million market

How Kaiser Controls Air Pollution At Fontana Steel Plant 31
Part II gives details on air cleaning, unique employe incentive system

Top Management Looks At Air Pollution 37
Policies and attitudes held by some of nation's major firms

Better Air For Industry 41
A frank discussion of the pros and cons of various air cleaning units

Specifications . . . Open, Closed, Or Base Bid? 45
Which do you prefer? Here's an outline of the features of all three

DEPARTMENTS

Letters 2
Newsletter 9
Editorial 11
News of the Industry 12
Air Pollution Complaint$ 15
Meetings 15
New Literature 16
New Appointments 19
Communications Center 35
New Products 48
Advertisers Index 52
Classified Ads 52
Professional Services 52

COVER

Processing towers in the petrochemicals industry soaring to the sky are depicted in this month's cover. Artwork was supplied by courtesy of Cities Service Oil Co., Inc.

AIR ENGINEERING is published monthly by Business News Publishing Company, at 450 West Fort Street, Detroit 26, Michigan. Subscription prices: United States, Canada: $3.00—1 year; $4.50—2 years; $6.00—3 years. Foreign: $5.00—1 year; $8.50—2 years; $12.00—3 years. Single copies 50 cents. Application to mail at second-class postage rates is pending at Detroit, Michigan. First issue April, 1959. • CHANGE OF ADDRESS. Notify AIR ENGINEERING and your local post-office of both your old and new addresses including postal zone numbers by 12th of preceding month.

• CONTENTS COPYRIGHT 1959 by Business News Publishing Company. Reproduction of material may not be made without written permission of the publisher.

Air dust-free as wind-scoured mountain slopes! Dust-magnet filters are electrostatic, trapping particles small as 1/10th of a micron. Permanent, non-clogging . . . when dirt-laden simply rinse clean and replace in unit. Available for furnaces and air conditioners. As you live and *breathe* . . . install Dust-magnets!

DUST-magnet
FILTERS

a product of Stoddard Industries

3383 E. Layton Ave., Cudahy, Wisconsin

Letters

(Continued from preceding page)

for many, many years.

It was very apropo that the first issue of your new publication that reached our office included the article "Primer on Factory Ventilation" Part 2 discussing gas fired make-up air systems. We are often faced with the problem of speaking with city code administrators with regard to the non-hazardous results of a properly installed direct fired air supply system.

We normally utilize data and information gathered and published by our company. However as you know, it is always helpful to have information published by other respected organizations to back up such discussions.

In line with this, we would appreciate your advice with regard to availability of reprints of your article "Primer on Factory Ventilation" Parts 1, 2 and 3.

We also request your permission to reproduce this information for our purposes of promoting the sale of direct gas fired air supply burner equipment.

Best wishes for the continued success of your new publication.

John E. Wertzler
Maxon Premix Burner Co.
Muncie, Ind.

Editor:

A few days ago I received the first issue of my subscription to AIR ENGINEERING, the August, 1959 issue.

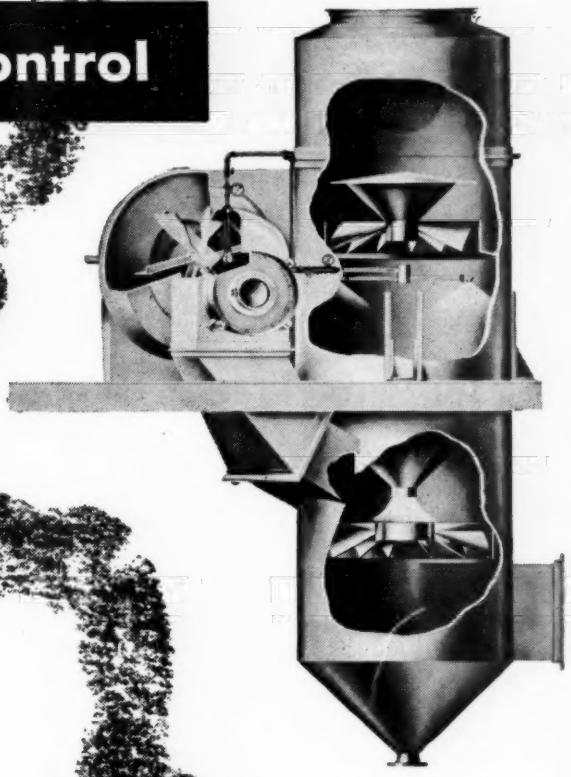
It is hard to express the feeling I had after reading this issue. It is just what we needed. Keep up the good articles on Engineering Meteorology. This magazine should really go places.

I was invited to become a charter subscriber, but somehow the reservation form just got mislaid and didn't get sent in soon enough, so I missed the first priceless issues. I would like to order all numbers before the August issue that are still available.

P. John Breukelman, C. M.
D.B.C. Weather Bureau
Tucson, Arizona

Use Communications Center, page 35, for requesting more information about articles, advertised products, literature, etc.

. . . in wet dust control



Patented

NEW DUCON DYNAMIC WASHERS

RECOVER DIFFICULT DUSTS EFFICIENTLY AND ECONOMICALLY

Ducon UW-4 Dynamic Wet Dust Collectors have added a new dimension in dust recovery. They have replaced, with outstanding success, many more costly and less effective dust collectors in the recovery of "difficult" materials, such as fine and abrasive dusts in kilns, rotary driers and other applications.

The UW-4 Washers are also ideal for high loading conditions where maximum efficiency is desired.

Ducon UW-4 washers offer other unique advantages, including constant air capacity, low water consumption and rugged construction. They are self-cleaning and fire and explosion proof.

For complete information write for Bulletin W-7456.

DUST CONTROL SYSTEMS AND EQUIPMENT — DUCON

the name in DUst CONtrol

THE Ducon COMPANY INC.

147 EAST SECOND STREET • MINEOLA, L. I., NEW YORK

Canadian Branch:
THE DUCON COMPANY of CANADA, Ltd.,
1131 Pettit St., BURLINGTON, ONTARIO

CYCLONES • CENTRIFUGAL WASH COLLECTORS • TUBULAR CLOTH FILTERS • DUST VALVES

Checking specifications and comparing notes prior to "blast-off" of unit #3 at Astoria Generating Station, Long Island, New York.

built BIG for a BIG job at Con Edison

Inspecting three of a total of 24–84" Duct Fans recently installed at Consolidated Edison's new Arthur Kill and Astoria, New York Generating Stations are a member of Con Edison's Engineering Staff and D. J. Citron, New York area representative for Aerovent.

Twelve units, rated at 100,000 cfm each, provide a total of 1,200,000 cfm to draw heat from boiler plants in both locations. In addition, eight 32" Panel Fans, rated at 10,000 cfm each, cool turbine rooms at each station. That's cooling – KING SIZE!

Write for Bulletins 100 and 151

Air deliveries of Aerovent equipment determined in accordance with established and accepted codes and guaranteed by manufacturer.

CERTIFIED PERFORMANCE

Aerovent
FAN COMPANY, INC.
Ash and Brian Sts. Piqua, Ohio

Consolidated Edison's new Arthur Kill Generating Station situated at Staten Island, New York.

Letters

Philadelphia Does Not Encourage Domestic Incinerators

Editor:

I read Mr. William R. Herbert's comment on your August editorial re incinerator, with considerable interest. I feel called upon to correct an erroneous impression which this letter may have created.

Philadelphia's Air Pollution Control Section does not, at this time, encourage the installation of domestic incinerators; nor have we rewritten our codes to allow the installation of such incinerators.

We have recently been conducting, in cooperation with the Philadelphia Gas Works, a study of the new type domestic incinerators to determine, insofar as possible, whether or not such units if installed in Philadelphia could be operated without the creation of undue nuisances. These tests have included odor and smoke panel evaluations; laboratory tests; and field trials.

Our study to date has indicated that the new type domestic incinerators, by and large, cannot properly be called smokeless and odorless. In fact the majority of such units tested failed to pass our smoke and odor panel.

At the present time there is considerable question

(Please turn to page 8)

MEASURE
actual air velocity instantly with Alnor® VELOMETER

A simple, direct reading on the Alnor Velometer gives you an instant measure of air flow speed through grilles, ducts, furnaces, spray booths, or in the open.

Precision-built and self-contained, this portable instrument brings laboratory standards to the line or field installation. Available in a wide variety of scale ranges, full assortment of jets and fittings. You'll want all the facts (no safety department should be without a Velometer). Get Bulletin 2448-G. Attach this ad to your letterhead and mail to: Illinois Testing Laboratories, Inc., Room 570, 420 No. LaSalle St., Chicago 10, Illinois.

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Alnor

Climate by Chrysler

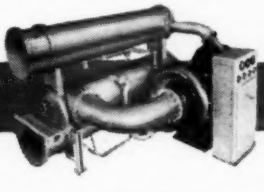
500 tons of cooling power from a 400-hp motor brings double savings to new Greenville Auditorium

A 500-ton Chrysler Centrifugal Liquid Chiller is the heart of the air conditioning system in the new Memorial Auditorium in Greenville, S. C. It cost less to install . . . and every second it operates, it's saving more money. Here's why:

Chrysler's exclusive true volute compressor casing design reduces horsepower requirements per ton of air conditioning. So Greenville saved money on initial costs by using a 400-hp motor . . . instead of the 450- to 500-hp motor needed by similar units. Operating costs are lower, too . . . because the smaller motor takes less power.

Whether there are 7,000 people—or 700—inside the auditorium, this versatile system handles the load perfectly. With Chrysler's exclusive adjustable guide vanes, output of the system can be reduced to 10% of maximum capacity, providing the most economical operating conditions for any size audience.

No matter how large the air conditioning job, Chrysler Liquid Chiller equipment can be custom-engineered to your needs. For complete information, contact your local Chrysler Applied Machinery and Systems sales office. Or write: Airtemp Division, Chrysler Corporation, Dept. AA-129, Dayton 1, Ohio. In Canada: Therm-O-Rite Products, Ltd., Toronto, Ontario.

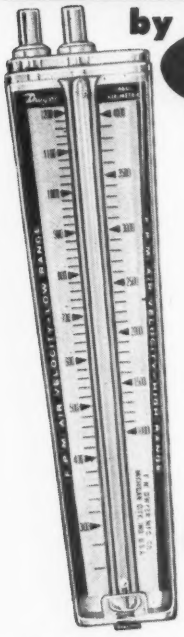


CHRYSLER AIRTEMP

FIRST WITH THE FINEST IN AIR CONDITIONING

new No. 460
AIR METER

by Dwyer



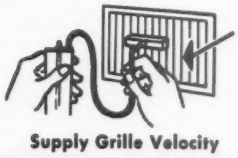
An All Purpose Low-Cost Instrument for Static Pressure and Air Velocity Measurements

High and low ranges give direct velocity readings from 260 to 4000 fpm.

Static pressure readings from .005 to 1.0 inches of water.

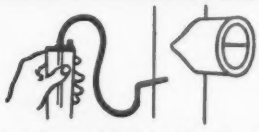
Complete with every accessory for adjusting and balancing air conditioning, heating and ventilating equipment.

Fits in shirt pocket.



Supply Grille Velocity

Return Grille Velocity



Over-Fire and Smoke Pipe Draft

Static Pressure

WRITE FOR BULLETIN B-9

F. W. DWYER MFG. CO.

P. O. Box 373-A
Michigan City, Indiana

Letters

(Continued from page 6)

as to whether or not any of some seven units tested can be considered sufficiently free of operating problems; mechanical problems; and air pollution problems to warrant their extensive installation in this community.

Raymond Smith, Chief
Air Pollution Control Section
Philadelphia, Pa.

Odorless Incinerators

Editor:

As President of a corporation manufacturing domestic gas incinerators, I could not help but take exception to your editorial "Municipal vs. Residential, Apartment House Incineration . . . The Battle Is On" in the August issue of AIR ENGINEERING.

The points you make concerning apartment house incineration vs. domestic incineration are of little concern to our company since we manufacture only residential incinerators aimed at providing modern efficient smokeless odorless garbage and trash disposal.

A great deal of industry research development as well as individual manufacturer's engineering and design have gone into today's modern gas incinerator. The new smokeless odorless units are automatic, easy to operate, and relatively service free. When properly installed they do an excellent job of disposing of rubbish, trash, and garbage without smoke and odor.

The modern gas incinerator has found acceptance in many major markets, and its acceptance is growing.

I trust that this letter will give you current information on today's smokeless odorless domestic gas incinerators.

Julius Klein
Caloric Appliance Corporation
Jenkintown, Pa.

From the editor:

Letter below from Bob Wellstead originally ran four closely-spaced type pages. We have extracted pertinent paragraphs.

Editor:

Is homeowner burning objectionable? Is a 100 percent homeowner incinerator program unhealthy, nauseating, dirty? Take, for example, the community of Lincolnwood, Illinois, where competitively priced ($17,000) and upper income ($20-$60,000) homes intermingle on Chicago's near Northwest side. One who has seen the snow blanket three days old laying on these lawns knows there can be no particulate problem in Lincolnwood skies. Heating in the community is nearly 100 percent oil or gas, industrial and commercial establishments are few. Lincolnwood has the lowest tax rate in Cook County!

Is apartment house waste burning objectionable? Certainly, in many respects, particularly when stair step type of construction has placed a new building each decade with its upper floors above chimney tops of older neighbors. Yet probably more wastes are burned in the apartment house furnace, water heater, than are collected today in most communities. Apartment house incineration . . . can be performed destroying combustible waste loads to complete neighborhood acceptance.

We blame with good cause the motorist and passerby with the litter on our streets, the rubble in the gutter. Yet look at the new apartment house projects with incineration. Premises and neighborhoods can be kept free from this minor amount of debris. Look at the typical "neighborhood center" of apartments and commercial establishments where collection is practiced. Droppings from carried waste containers, trailings from the waste pile, scatterings from the collection trucks, accumulate in corners, gutters, fence rows . . . a voluminous litter that neither city nor citizen efforts can overcome.

Homeowners, commercial property custodian, factory workers can today be furnished equipment that can burn all commonly occuring waste materials without creating any conditions (leading to) neighborhood objections.

Bob Wellstead
Brule Incinerator Corporation
Blue Island, Illinois

Editor:

May we say that we are looking forward to receiving your magazine with a great deal of interest, and believe it will fill a definite need in our field.

John G. Schutz
Advertising Manager
Research Products Corp.
1015 E. Washington Ave.
Madison 10, Wisconsin

AIR ENGINEERING Newsletter

AIR POLLUTION CONTROL • AIR MOVING • AIR CONDITIONING

Auto Makers Report Breakthrough on Controlling Hydrocarbon Emissions

Automobile Manufacturers Association has just recently informed California authorities that a device to eliminate substantial portions of the hydrocarbon emissions of automobiles will be offered on new American made cars produced for sale in California not later than the time of introduction of 1961 models. The relatively inexpensive device feeds crankcase fumes back into the engine to be burned in the cylinders.

Steel Mills Not Biggest Culprit in Pittsburgh Pollution, Strike Shows

The 116-day steel strike has proved without a doubt that the steel mills are not the major source of dirty air in Pittsburgh, according to a report in the *Wall St. Journal.* The *Journal* quoted an unnamed health official as saying that "small industrial plants, commercial sources, unauthorized burning, and vehicular exhausts contribute a much greater degree of pollution than steel operations." (Coming in AIR ENGINEERING, a U. S. Public Health Service comparison of air pollution during steel mill operation and while mills are shut down.)

Aircraft Visibility Doubled at Detroit

Though it may come as a surprise to some Detroiters, Morton Sterling, chief of Detroit's Air Pollution Control Bureau, says that the number of hours with proper visibility for aircraft in the Detroit area has doubled during the past 10 years because of reduction in air pollution.

Proposed California Air Pollution Standards Accepted Generally

Representatives of industry and medicine testifying at the California Public Health Department's first public hearing in Los Angeles generally accepted standards of air quality and vehicle exhaust proposed by the Department.

While witnesses differed on inclusion of particular contaminants, most urged the department not to lower its standards generally. By February, the department must set pollution standards at three levels—adverse, serious, and emergency.

Pennsylvania Considers Air Pollution Bill

An air pollution and smoke control bill was recommended to the Pennsylvania Senate by its rules committee after earlier passage by the House.

It would create an air pollution commission with power to investigate complaints and seek court orders for compliance. The commission would set up a general plan for control and abatement of air contamination.

Proposal includes an allocation of $100,000 to launch the program.

Air Pollution Hits Downtown Merchants

Dust, soot, smog, and heavy chemical odors in downtown areas were cited as partial causes of downtown business declines in individual cities by James J. Bliss, assistant to the executive vice president and general counsel of the National Retail Merchants Association.

His advice: When a downtown is in trouble, its retail stores must get together and bail it out.

Air Pollution Foundation Sights End of the Road

Southern California's Air Pollution Foundation will complete its research for a workable and satisfactory solution to the smog problem by the end of 1960, according to Fred D. Fagg, Jr., president.

The Foundation's trustees, he said, have decided that 1960 shall be the final year for which the Foundation will raise operational funds and that it shall be dissolved thereafter upon conclusion of the scientific staff's work. Concluding reports will be published early in 1961.

British Find Way To Remove Sulfur from Chimney Stacks

The *Financial Times* of London reports a new process for removing sulfur from the chimney stacks of power stations and sulfuric acid plants. It also enables the sulfur salts to be recovered. The process involves use of ammonia gases that react to sulfur oxides to produce a fog of ammonia-sulfur compounds. Solid sulfur salts are then removed as a powder from the gas stream by electrostatic precipitators.

Beckman Instruments, Inc. Acquires Two Firms

Beckman Instruments, Inc. recently acquired the assets of Kruger Instruments, San Gabriel, Calif., and Tool-Lab, Inc. of Escondido, Calif. as part of its program to expand existing product lines. Kruger products include air pollution monitoring instruments. An initial cash investment of approximately $130,000 was involved.

Trane To Build Sheet Metal Plant In Utah

The Trane Co. will start construction soon on a new million dollar plant in Salt Lake City, Utah, to serve the 13 Western states including Hawaii and Alaska. The plant, to be in operation in about a year, will be basically a sheet metal operation, producing commercial air conditioners, heating units, fans, ventilating equipment, and heat transfer coils. Partial fabrication and final assembly of refrigeration compressors for big building air conditioning is also scheduled.

Robertshaw-Fulton To Market Free Piston Compressor

A gas-driven free piston refrigerant compressor will be manufactured and marketed by the Robertshaw-Fulton Controls Co., T. T. Arden, president, announced recently. He said units suitable for 3 to 6-ton air conditioners and smaller units for automobiles can be brought to market in 1961. The compressor will have only one moving part and will be competitive with present cooling systems, Arden claims.

Ions Have Effects Important To Health, May Be Medical Tool

Both positively and negatively charged ions have physiological effects important to health, according to a report made to the American College of Chest Physicians.

Two years of research has shown that negative ions in the air have a stimulating effect on the respiratory system, while an excess of positive ions is harmful. One of the factors that make these findings important is that factors in modern civilization such as air pollution and in some instances, air conditioning equipment, tend to reduce the natural negative charges in the air and increase the positive charges.

The research also carries the implication that medical men may be able to use ionized air in treating some respiratory complaints.

AIR ENGINEERING

Publisher: E. L. Henderson
Assistant Publishing Manager: P. A. Schildhammer
Editor: Eugene A. Sloane
Assistant Editor: George M. Hanning
Assistant Editor: Hugh T. Mahar
Research Manager: John A. MacLean
Advertising Manager: Alfred Chadburn
Advertising Production Manager: A. M. Barrow
Circulation Manager: R. M. Ashley
EDITORIAL ADVISORY BOARD: George F. Taubeneck • Phil B. Redeker • C. Dale Mericle
REPRESENTATIVES: NEW YORK 17—521 Fifth Ave., MUrray Hill 2-1928-9, R. M. Price, F. L. Taylor.
CHICAGO 3—134 S. LaSalle St., FRanklin 2-8093, M. R. Smith.
DETROIT 26—450 W. Fort St., WOodward 2-0924, Alfred Chadburn.
LOS ANGELES 43—4710 Crenshaw Blvd., AXminster 2-9501, J. A. Hannon.

EDITORIAL:

On Public Welfare . . . and Private Responsibility

We sympathize with the plight of the cranberry growers. At the same time, we applaud Secretary Arthur S. Flemming's stand in the matter of the contaminated cranberries.

It is Flemming's clear duty as Secretary of Health, Education, and Welfare to protect the health and well-being of his charges, the citizens of the U.S.A. If Mr. Flemming has so much as a *suspicion* that a general health hazard exists, it is his obligation to inform the public. Provided, of course, that this suspicion is based on factual evidence, as in the case of the contaminated cranberries, where the pesticide amino triazole caused cancer in animals.

It may well be true, as the cranberry growers point out, that many pounds of cranberries would have to be eaten to ingest enough amino triazole to cause cancer in one person.

Our point, and the reason we support Secretary Flemming in this matter, is that there is evidence to indicate that poisons from many sources in man's environment are *cumulative*.

The little bit of amino triazole in a spoonful of cranberry sauce may not cause cancer. But add to it the little bit of auto exhaust breathed on the way to work, the whiff of polluted air from a nearby factory, any of 18 lipstick coal tar dyes adorning our loved ones, the insecticides, the pesticides, the dyes used to color that pat of butter and the orange we had for breakfast, and you have a sum total of cancer causing agents ingested daily which may trigger a cancer cell into action.

Take the case of smoked hams, for instance. In this day of hurry, we smoke our hams chemically and add wood tars to give that "smoke house smell." The wood tars, among the cancer causing polycyclic aromatics, are another drop in the total bucket of daily ingested poisons.

Deaths from cancers of all types have risen alarmingly over the past few years. Indications are clear that improved methods of diagnosing cancer are not the sole cause of the rise. Mankind is, it appears, poisoning his environment faster than he can adapt himself physiologically to these poisons.

According to the California State Department of Health, the occupation bearing the highest lung cancer death rate was, of all things, restaurant cooking. Chefs breathe polycyclic aromatics from burnt fats of all kinds.

We are fouling up our environment, we repeat,

(Please turn to following page)

NEWS of the Industry

Shopping Center Developers Said To Be Passing Buck On Air Conditioning

Developers of suburban shopping centers who want tenants to provide air conditioning on a "do-it-yourself" basis, rather than installing a central system that will insure air conditioning for all functions of the center, are passing the buck.

That was the opinion ventured by Herman Guttman of Victor Gruen & Associates, speaking before the special Conference Session staged by the Air Conditioning & Refrigeration Institute during the 11th Exposition of the Air Conditioning & Refrigeration Industry in Atlantic City.

Suburban center developers offer the following reasons for having tenants put in their own systems:

1. No space is required for central equipment, but the tenant is expected to put his equipment in the valuable space he rents, or possibly on the roof.
2. No financing is required to cover the equipment cost because the developer has little or no money invested.
3. No operating personnel required.
4. Leasing is simplified because rent negotiations are not complicated by discussions of stand-by charges, dry bulb, wet bulb, diversity factors, and all the mumbo-jumbo that neither the leasing agent nor the tenant can comprehend.
5. No complaints about the air conditioning are voiced because they fall on deaf ears.

Guttman described the ingenious central heat pump system used at the 800,000-sq. ft. Southdale development in Minneapolis, which is used with package equipment to solve many of the problems presented in such an application.

But commenting on shopping center systems in general Guttman said:

"In spite of these achievements, the design of mechanical systems for shopping centers is still far too complicated. Provisions must be built in for those stores which stay open when the remainder of the center is closed.

"There are times when the mall is occupied and the stores are not. Merchandising promotions and special events require an elaborate degree of flexibility far beyond ordinary scope."

Editorial (*Cont.*)

On Private Responsibility . . . and Public Welfare

(Continued from preceding page)

faster than it is possible for Nature to adapt our bodies to withstand these poisons. Whether these poisons come from food, factory smokestacks, or lipstick, we should cast off these cancer causers fast.

After all, it tooks eons gradually to bring fish out of the water and change them to mammals. How long will it be before we will all be like a fish out of water with respect to the total environment we have to cope with?

There is evidence, for example, that we are deepening the blanket of CO_2 by our accelerated (and relatively inefficient) burning of fossil fuels faster than nature can match it with oxygen generation. Whether CO_2 will accumulate faster than we can adapt ourselves to breathe CO_2 instead of air is less certain, however, than the fact that the rise of cancer is faster than our bodies can cope with. That is, we are apparently poisoning ourselves with cancer causing agents faster than our bodies can learn how to protect themselves against these poisons, and at an increasing rate.

Therefore, Secretary Flemming is to be congratulated for his courageous stand, not only in the case of the contaminated cranberries, but for the stand he and his Department has taken on all of the poisons we pour on ourselves.

And the Congress is also to be praised for at last amending the Pure Food and Drug Act to put the burden of proof on the source rather than on the understaffed and under-equipped U. S. Public Health Service.

The engineering profession has a grave responsibility in this area of public health. The science of ventilation, conditioning of air, and the cleaning of air, has for the most part advanced to the point where its proper application can remove the source of many airborne health hazards. Burnt fats, for example, can easily be removed from the kitchens of California chefs.

It is the aim of this publication to provide the engineering profession with knowledge about their art that will protect and promote the health of the general public, insofar as the treatment of air can do so.

As air engineers, it is the private responsibility of each of us to protect the public welfare to the best of our ability. ▲▲

Consulting Engineers Protest "Free" Engineering Services By Others

Consulting engineers, at least those who are a part of the organization known as the Consulting Engineers Council, are planning a determined stand against any attempted inroads into their activities by other factors in construction work, or by government policy.

This was made evident at the recent semi-annual meeting of the Council, which is comprised of representatives of 27 state or regional associations of consulting engineers.

Those in the group who work in the field of mechanical engineering expressed strong opposition to the amount of engineering which they say is being done by manufacturers of equipment and by contractors.

Protests have been registered with manufacturers of "big" air conditioning systems relative to the activities of their field representatives in this regard.

Results of a survey of 71 air conditioning and heating equipment manufacturers, relating to this situation, were reported by Council Executive Secretary Larry N. Spiller.

Quoting from a number of replies, Spiller said it was obvious that there is a growing awareness among manufacturers of the consultants' feeling with regard to agent-design competition, and a readiness to take action to prohibit such activity.

A round-robin discussion on this problem among the consulting engineers in attendance revealed that opinions about the prevalence of engineering by manufacturing representatives to be spotty geographically.

In some areas, it was said to be growing, in others, virtually nonexistent. There was some opinion that such practices were most flagrant in areas where long-time representatives were still in the picture.

The fee structure for their services was an element around which major discussion developed at the meeting. Some of the local groups are studying and surveying actual fee structures in an effort to develop "recommended practices." But there is no intent to try to obtain a "national" fee schedule or any belief that such an ideal is obtainable at this time.

In a discussion of the relationship between consulting engineer, architect, and contractor, the question of ultimate responsibility for the job came under consideration.

This matter of responsibility for the job was shown to have implications not only as concerns liability for non-performance or dissatisfaction, but also where an injury or damage to individuals is concerned.

An example was cited of a court case in Louisiana involving a boiler explosion on a new construction job, which resulted in the accidental death of a workman. A lower court found the architect the responsible party, it was reported, on the theory that he had the overall responsibility for the job. A higher state court upheld the verdict and upped the award for damages.

In certain fields of engineering the architects are finding conflict with government "bureaucracy" at the state and national levels. Bureaucrats tend to take the attitude that there is sufficient engineering talent among public employes to design government projects. The engineers contend this isn't so.

Further, they say that such an attitude constitutes an injustice and is contrary to general government policy.

The engineers are also concerned with the practice of "moonlighting" by government engineers, particularly on projects being handled by the agency that employs them.

So. Calif. Contractors Consider Bid Depository

Refrigeration & Air Conditioning Contractors Association of Southern California, Inc. announced plans for a meeting with representatives of the Mechanical Contractors Association of Southern California to discuss whether or not a bid registration (bid depository) plan is feasible for those companies working on mechanical contracts.

Bid depository plans have been operating in some other California areas.

L. A. Asks State to Set Clean Air Standards

The Los Angeles area had some heavy, eye-smarting smog earlier this Fall, and public officials clamored loud and long for action. Some of the things they called for:

1. Re-submission of a bill in the state legislature which would give the state the responsibility for establishing statewide air pollution standards on various air pollution components, such as carbon monoxide, ozone, sulphur, and nitrogen oxide. It may also be proposed that either the state or counties can require exhaust control devices on vehicles.

2. The Los Angeles County Board of Supervisors passed an order that anyone who has a possible solution to the smog problem be received courteously and given a hearing. Air Pollution Control District officers were criticized for not being "courteous" to those who had proposals for doing away with the smog. One county supervisor cited a man who wanted to "cut a slot in the mountains to carry away the smog."

Said the supervisor: "Who knows? Maybe it will work. It shouldn't be laughed off."

3. Automobile manufacturers were criticized as being "unconcerned" and "ignorant" of the smog problem. One indignant city official said "some of the auto makers ought to be made to live in our worst smog areas."

Air Conditioning Said To Eliminate Smog

On installations made in Southern California, smog control equipment has become a natural running mate to air conditioning equipment, notes Irving Secord, sales manager, Drayer-Hanson.

When the firm recently supplied unitary equipment to the U.S. Department of Agriculture Fruits and Vegetable Laboratory in Pasadena, an auxiliary activated carbon filter set-up was called for. It is used to filter the ozone content, said to be at record highs because of U.S. Army tests on rubber

(Please turn to following page)

NEWS of the Industry . . .

(Continued from preceding page)

products being conducted in the area.

In Beverly Hills, where the six-story office landmark building owned by the estate of Louis B. Mayer is now being converted to year-round air conditioning, smog will be entirely eliminated from the building.

Backing D-H floor-mounted room-by-room console type air conditioners in each office and suite will be activated carbon filters to do the job of total smog black-out.

Secord believes the trend began a couple of years ago, when the Pacific Mutual Building in Los Angeles installed a zoned system, believed to be the largest air conditioning system ever installed in an existing structure in the West. Specified was complete smog control using an activated charcoal filter system especially designed by Burke Engineering Co.

New Fire Safety Standards Available

Many changes in fire safety standards are incorporated in a new and revised edition of the National Fire Codes recently published by the National Fire Protection Association.

The six-volume 1959 edition is a compilation of the 177 standards developed by NFPA in the fields of flammable liquids and gases; combustible solids, dusts, chemicals, and explosives; building construction and equipment; extinguishing equipment; electrical installations; and transportation.

The National Fire Codes ($7 per volume, $35 for the set of six) may be obtained from the Publications Dept., National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass.

Fly ash, the residue of burned coal carried up through smoke stacks and collected (where proper air pollution control is carried out) usually through electric precipitation devices, is no longer presenting the problem of "total loss" in its removal that it once did.

The residue is now being put into ready-mixed concrete as a metal polishing agent and is even used in sand blasting as a substitute for more expensive sands.

New York Gas & Electric, whose service area covers upstate New York, is using it to fill in the space between several hills, with an eye to improved real estate values.

Clean Air Terms Defined By San Francisco APCD

"Clearing the air" about certain words and phrases used in air pollution control work was a special project of the Bay Area Pollution Control District (San Francisco) during National Cleaner Air Week.

"Some terms of measurement of control have been used frequently in public hearings and stories on our proposed Regulation No. 2," explained Control Officer Benjamin Linsky.

"We'd like to make sure that residents of the area know what these words mean, and see why certain restrictions should be made.

So the terms used in describing air pollution conditions were explained in the following fashion:

Grain-loading: refers to the concentration of solid particles, and liquid droplets in gases and solid particles suspended in a stream of gas, which may be emitted from a process.

The term "grain" is a weight measure equal to 1/7000th of a pound, not necessarily in "grain" form. When dusts and droplets are "loaded" into the air, the quantity is usually described in terms of grains per cu ft of gas.

Process weight: refers to a restriction on the pounds per hour of dusts and droplets which can be emitted into the air by a given process. It is based on the weight of material which is processed.

Ringelmann: refers to a chart of individually numbered white areas, covered by black lines. The proportion of black lines shows differences and shades of gray of a plume which obstructs visibility. (For instance, Ringelmann No. 1 shows 20% obstruction, and Ringelmann No. 4 shows 80% obstruction.)

The Ringelmann scale is also used to judge the opacity of emissions that are not black in color, but are brown, cream, or some other color. This is referred to as "equivalent opacity."

Volume in parts per million: refers to a measurement of concentrations of gases, based on a unit of one million parts. (For example, 1 ppm sulfur oxide indicates that one part out of a total volume of one million parts of gas was identified as sulfur oxide.)

Several types of gas concentrations are measured this way, including the total concentration of combustible gases, certain types of incompletely burned gases, and sulfur oxides at both ground level and in exhausts.

The Air Pollution Control District staff working with an Advisory Council is currently working on the job of determining to what degree limits on emissions must be imposed in order to assure healthful living throughout the six-county Bay Area.

New Auto Exhaust Unit Said To Check Crankcase Fumes, To Be Low Cost, Effective

The automobile industry is convinced that it has found a device that will eliminate substantial portions of hydrocarbon emissions of automobiles, and is setting out to make this device available in 1961 models of automobiles, the Automobile Manufacturers Association announced late in November.

Manufacturers will begin production engineering and tooling immediately, the Association said, in order to get the device ready for installation on 1961 models built for the California market.

The method employs a device that checks emission "blowby" vapors from the engine crankcase. Uncomplicated and inexpensive compared with exhaust control mechanisms previously announced and still under intensive development, the device feeds crankcase fumes back into the engine to be burned in the cylinders, the Association stated.

The crankcase device is a system of piping and valves. Similar equipment has been used for some time on taxicabs, motor trucks, and military vehicles for other purposes.

Meetings, Courses,

U. S. Public Health Service course in "Medical and Biological Aspects of Air Pollution," *Robert A. Taft Sanitary Engineering Center, Cincinnati, Jan. 11-15.*

Society of Automotive Engineers, Inc. annual meeting, *Hotel Statler, Detroit, Jan. 11-15.*

Three day conference on "Man and His Environment: The Air He Breathes," *University of California School of Medicine, San Francisco, Jan. 16-18.*

11th Plant Maintenance and Engineering Conference and Show, *Convention Hall, Philadelphia, Jan. 25-28.*

2nd Southwest Heating and Air Conditioning Exposition, *Memorial Auditorium, Dallas, Texas, Feb. 1-4.*

U. S. Public Health Service course in "Microscopic Analysis of Atmospheric Particulates," *Robert A. Taft Sanitary Engineering Center, Cincinnati, Feb. 15-26.*

Ninth annual Industrial Ventilation Conference, *Kellogg Center, Michigan State University, East Lansing, Mich., Feb. 15-18.*

Air Pollution Control League of Greater Cincinnati 54th annual meeting, *Auditorium, Cincinnati Public Library, Cincinnati, Feb. 17.*

American Chemical Society, 137th national meeting, *Cleveland, April 5-14.*

American Society of Industrial Hygiene annual meeting, *War Memorial building, Rochester, N. Y., April 25-28.*

Industrial Heating Equipment Association, Inc., *The Homestead, Hot Springs, Va., May 22-25.*

Air Pollution Control Association 53rd annual meeting, *Netherland-Hilton hotel, Cincinnati, May 22-26.*

Design Engineering Show, *Coliseum, New York City, May 23-26.*

Institute of Boiler and Radiator Manufacturers annual meeting, *Seaview Country Club, Absecon, N. J., Week of June 6.*

American Society of Heating, Refrigerating & Air-Conditioning Engineers annual meeting, *Royal York hotel, Vancouver, B.C., Can., June 13-15.*

13th International Congress on Occupational Health. *Waldorf-Astoria hotel, New York City, July 25-29.*

Pollution Complaint$

Buffalo, N. Y.—The Cheektowaga Air Pollution Board last month issued a new demand that the U.S. Rubber Reclaiming Co., on Walkowiak St., control odors from its plant.

• • •

Fairport Harbor, Ohio—Salt dust from a new mine here is being blamed for possible permanent damage to trees and shrubbery in Headlands State Beach Park and the Mentor Marsh wild life preserve.

Salt dust is blown over a wide area on windy days when crushed salt is dumped into the open by a conveyor system to be stockpiled or hauled away.

Morton Salt Co., owner of the mine, is reportedly taking public complaints under advisement.

• • •

Toledo, Ohio—Overloaded filtering equipment was blamed recently for a dense, fume-filled fog that shrouded a three-block area of South Toledo for about 20 minutes. The fog cut visibility to 100 ft. and made breathing uncomfortable.

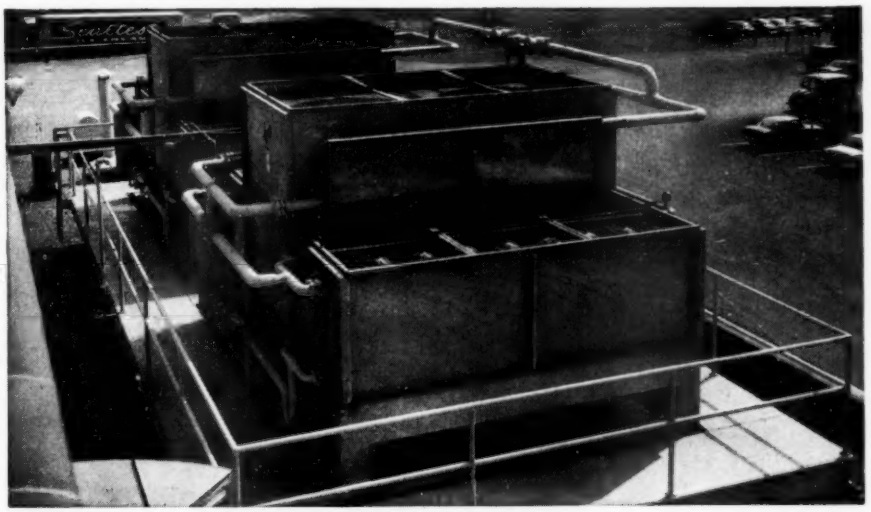
Paul D. Findlay, city air pollution control inspector, traced the difficulty to the Ottawa Chemical Co. He found that air pressure in the filter had built up too high, though the scrubbing equipment was not faulty.

Weirton, W. Va.—"The Episode" last September has the Weirton Steel Co. considering the cost of setting up an air monitoring system throughout the valley and adjoining heights here.

"The Episode" is what local people reportedly call the day when 13 persons in five homes were taken to the hospital unconscious

• • •

London, England—Smog masks sold rapidly last month when a heavy fog blanketed southern England and all the countries around the North Sea. Britain's Clean Air Society estimated that a foggy day costs London $28 million in transport disruption and cleaning bills.



MODERN NIAGARA CONDENSERS PAY FOR THEMSELVES IN EXTRA SAVINGS

These Niagara condensers are lower in first cost and assure you of trouble-free automatic refrigeration. Special features: "Aeropass" coil removes super-heat to give you condensing at lower temperatures and prevent loss of capacity by the scaling of condenser tubes; "Oil-out", oil separator between pre-cooling and condensing coils gives you always an oil-free system; "Panel-Casing" construction gives you access to every part of the condenser for inspection and maintenance. Operating engineers say these condensers "save half the work of running a refrigerating plant". Managers who know costs and profits prove that Niagara condensers bring them great returns in power savings, water savings and reduced maintenance expense.

Write for Bulletins 131 and 142.

NIAGARA BLOWER COMPANY

Dept. AIR-12, 405 Lexington Ave., New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

New Literature

Reznor General Catalog

Twenty-eight page general catalog describes in detail entire Reznor line of gas-fired furnaces, heaters, and packaged blowers. Illustrated table of contents enables readers to select heaters and furnaces according to types, applications, capacities, and major features.

Complete specifications and dimensional and performance data are included for each product category. Special sections discuss applications.

Source: *Reznor Mfg. Co., Dept. AE, Mercer, Pa.*

Kohlenberger Air Dryer

New technical bulletin describes the KCD industrial instrument air dryer, designed for use where clean dry air is needed for instrumentation, controls, or processes. Two-color bulletin includes specifications, dimensional drawings and typical refrigeration and air-circuit diagrams.

Source: *Kohlenberger Engineering Corp., Dept. AE, 1600 Commonwealth, Fullerton, Calif.*

Russian Air Pollution Study

A translation by Dr. B. S. Levine, U.S. Public Health Service research grantee, of the Russian book "Sanitary Protection of Atmospheric Air: Purification of Industrial Discharge Gases from Suspended Substances" has been published by the Office of Technical Services, U.S. Department of Commerce. The book was written by V. N. Uzhov of the Technological Div. of the Institute for Making Gas Purifying Equipment in Moscow. Price is $3.

Dr. Levine's translation of the three-part Russian book "Limits of Allowable Concentrations of Atmospheric Pollutants," edited by Prof. V. A. Ryazanov in Moscow, is also available from OTS. The three volumes, all of which appear under the same title, are: 59-21173 Book 1, 1952, 145 pages, $2.75; 59-21174 Book 2, 1955, 179 pages, $3; and 59-21175 Book 3, 1957, 152 pages, $3.

Source: *Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D. C.*

Report 29, Air Pollution Foundation

Third technical report on work performed in smog chamber at Stanford Research Institute covers "Photooxidation of Hydrocarbons in Mixtures Containing Oxides of Nitrogen and Sulfur Dioxide."

Report concludes that probable eye irritants in photochemical smog are formaldehyde and acrolein. These aldehydes are formed only from olefinic hydrocarbons. Los Angeles-type smog can be eliminated by drastic curtailment of atmospheric olefins.

Prepared by E. A. Schuck and G. J. Doyle, the report is priced at $3.

Source: *Air Pollution Foundation, Dept. AE, 2556 Mission St., San Marino, Calif.*

Foundry Exhaust Hood

New 28-page "Manual of Exhaust Hood Designs for the Foundry Industry" illustrates various exhaust hoods designed for many different operations common to the foundry.

Bulletin 270-E2A Vol. 2 contains 46 installation photographs which illustrate the use of exhaust hoods in foundry shakeouts, melting furnaces, grinding and abrasive sawing, swing frame grinding, abrasive cleaning and tumbling, sand handling, and conditioning.

Source: *American Air Filter Co., Inc., Dept. PD-AE, 215 Central Ave., Louisville 8, Ky.*

Mist Eliminator Comparison Chart

Handy chart gives density, style and use of wire mesh entrainment separators, mist eliminators, or demisters. Style numbers and type names used by major manufacturers of these products are listed, allowing comparison of density and mesh structure to be made.

Style numbers are shown for all standard and special purpose meshes in the Schuyler line, the only *complete* mesh line available.

Source: *Schuyler Mfg. Corp. Dept. AE, 84 Porete Ave., North Arlington, N. J.*

Chemical Industry Facts Book

Current factual information on the chemical industry's contribution to the economy, its plants and workers, its past and future, its research and development are found in the 1960-61 edition of "Chemical Industry Facts Book." Price: $1.25.

Source: *Manufacturing Chemists' Association, Inc., Dept. AE, 1825 Connecticut Ave., N. W., Washington 9, D. C.*

Dual-Duct Mixing Units

Photographs, details, and dimensions of Dual-Duct air mixing units with unique patented automatic volume control features are included in a new two-color catalog.

Bulletin DD-6 contains detailed performance data, specifications, dimensions and arrangements of Dual-Duct systems for different types of buildings and zoning arrangements.

Source: *Buensod-Stacey, Inc., Dept. AE, 45 West 18th St., New York City.*

Use Communications Center, page 35, for requesting more information about articles, advertised products, literature, etc.

New Appointments

Crawford E. Steiss has been named vice president for sales of L. J. Wing Mfg. Co., Div. of Aero Supply Mfg. Co., Inc. Steiss will be in charge of all Wing sales activities.

C. E. Steiss

Steiss comes to Wing after 14 years with Sheldon's Engineering, Ltd., Canada's largest and oldest manufacturer of industrial fans. Most recently, he was western sales manager.

John C. Cleeves, recently of Manchester, England, has become associated with Pangborn Corp. as development engineer, Dust Control Div. Cleeves, a graduate of Cambridge University, has specialized in industrial dust and fume control problems with Tilghmans Ltd., Prat-Daniel Ltd., and Sturtevant Engineering Co., Ltd.

J. C. Cleeves

Election of **Edward B. Tuttle** to director and vice president of manufacturing was announced by the Thatcher Furnace Co. Tuttle was formerly production superintendent.

City of Cleveland has appointed **Albert Locuoco** chief of its industrial air pollution control program. Locuoco heads a major division in the Air Pollution Control Dept. headed by Commissioner Leroy Diehl. For eight years prior to becoming a city employe 18 months ago, he was vice president in charge of research for Center Chemical Corp.

Promotion of **Kenneth C. Mirov** to manager of the San Francisco office has been announced by the Trane Co. He had been assistant manager of that office since last May.

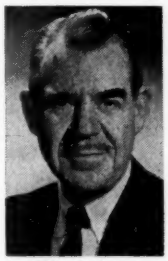
Trane has assigned **Alvin L. Balzer** to the San Francisco office and **Joseph G. Skach** to the St. Paul, Minn. office.

Detroit Stoker Co. has appointed **Merle J. Churchill** manager of Stoker sales. He will continue direction of the advertising and sales promotion program.

Detroit Stoker also appointed **Robert H. Schenker Co.** as Philadelphia district representative covering eastern Pennsylvania, southern New Jersey, Maryland, Delaware, and the District of Columbia.

It appointed **John C. Rutter** as assistant to the New York district manager. Rutter has an experienced background in both engineering and sales of steam power equipment.

Appointment of **Warren Fitch** as head of Airtemp packaged heating and cooling department with the title of manager of marketing is announced by Joseph P. Ogden, vice president-sales of Chrysler Corp., Airtemp Div. Fitch formerly was director of distribution.


W. Fitch

Working directly under Fitch is **Ralph J. Link** as sales manager. Link had been product planner, residential units, for the department. **A. F. Schiffmann** was transferred to the department as national accounts manager.

Other new appointees in the department are: **Ralph A. Gonzalez** as manager of industrial sales, **William L. Regan** as manager of distribution, and **William H. Denton** as manager of sales planning for commercial products.

Recent appointments in the American-Standard Industrial Div. include:

J. F. Tobin

John F. Tobin as vice-president-marketing. A former regional manager, he now directs the division's complete marketing program. He succeeds **E. W. Petersen,** who will act as a consultant until retirement, Jan. 1, 1961.

J. W. Hosler

James W. Hosler as general sales manager. He was formerly marketing manager for Kewanee and Nesbitt products.

Richard J. Riedl as product manager of heat exchanger products department. He was formerly manager of contract engineering at the Buffalo plant.

Appointment of **Richard E. Nemmers** as general sales manager of Waterloo Register Co., Inc., has been announced by E. T. Kelly, president.

R. Nemmers

Nemmers, who previously served as assistant sales manager, has been with the company since 1953. Before joining Waterloo he was a member of the Sales and Marketing Div. of Gulf Oil Co.

Some confusion developed in the November issue as to who was who in a number of appointments. To set the record straight, correct identifications are below:

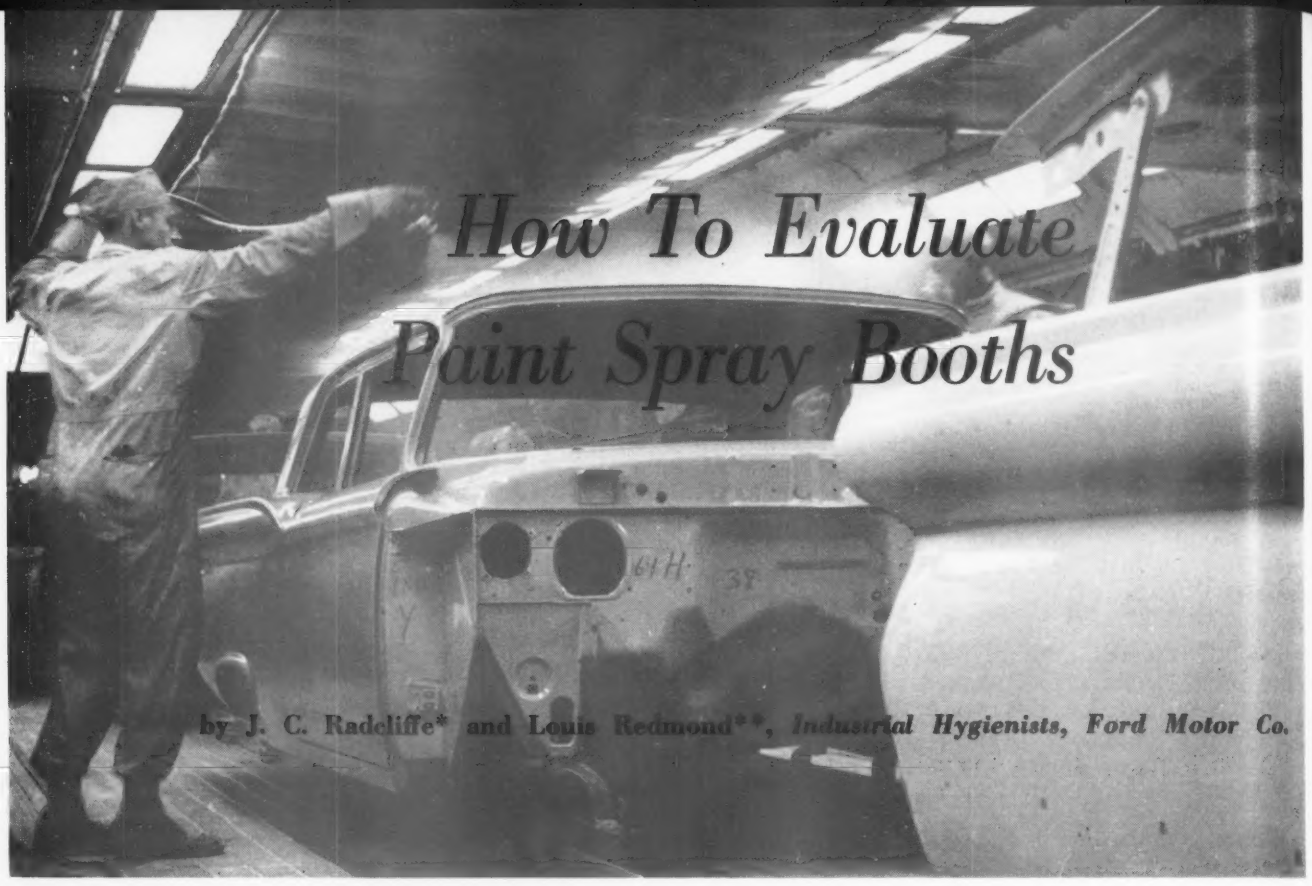
A. Andrews

H. Carnahan

G. S. Myers

W. F. Peters

Andrews is president of American-Standard Industrial Div.; **Carnahan** and **Myers** are vice presidents of sales and manufacturing, respectively, of Penn Controls, and **Peters** is general sales manager of Anemostat Corp. of America.



How To Evaluate Paint Spray Booths

by J. C. Radcliffe* and Louis Redmond**, *Industrial Hygienists, Ford Motor Co.*

Paint spray booths can be pretested before purchase to assure paint and pigment removal, operator health and cleanliness, low maintenance, and paint and pigment emission control from stacks. Here's how they do it at Ford Motor Co.

INCREASED PRODUCTION AT FORD'S many plants has some time ago begun both to overload paint booths in existing plants, and to require additional booths in new plant construction.

In order to evaluate performance of paint spray booths as an aid in their selection, our job as industrial hygienists was to work closely with the plant engineering department in setting up booth performance standards, and making certain that booths to be purchased would meet these standards.

Factors considered critical in paint spray booth evaluation included:

1. *Air flow inside booth* should be sufficient to remove paint pigment and solids fast enough to protect operator's health and cleanliness.

2. *Subsequent paint colors* on moving assembly lines should not give mixed painting effects. (To this end, a standard arrangement of air supply inlets and exhausts were proposed for larger car body booths and for small parts booths.)

3. *Maintenance must be kept to a minimum.* Paint should not adhere to back plates and booth sides in excessive amounts.

4. *Solvent and pigment emission* from exhaust stacks must be controlled to avoid air pollution problems.

For smaller booths, (small parts spraying) we selected the side water wall type, with air flow being introduced behind the man, flowing past him and into the water wall. Exhaust is provided below water wall. Quantity of exhaust for these booths was set at 1000 cfm/ft. of water wall. This design value gave a velocity of air flow past the man's breathing zone approximating 150 fpm, assuming an equal distribution of air flow. These values have been satisfactory in booths we have since installed.

In the larger, car body booths, an overhead air

---

*J. C. Radcliffe, a graduate of Rutgers and Harvard University, has, since 1941 worked in industrial hygiene with the U. S. Public Health Service and the State of New Jersey. He now supervises the industrial hygiene program at Ford Motor Co. He is president-elect of American Industrial Hygiene Association.

**Louis Redmond, a graduate of Wayne State University, was affiliated with the Industrial Hygiene Bureau of the City of Detroit from 1949 to 1951. In 1952, he joined Dura Corp. and in March, 1955 the industrial hygiene unit of Ford Motor Co. He belongs to AIHA and the American Institute of Chemical Engineers.

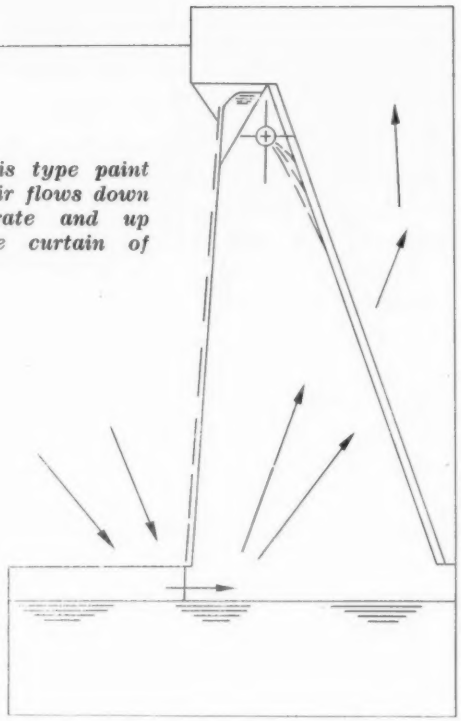


Fig. 1: *In this type paint spray booth, air flows down into floor grate and up through single curtain of water.*

supply and a grated floor exhaust system is used, with a total air flow equal to 1500 cfm for a 12 to 15 ft. wide booth for each one foot section. This provides a downward flow of air equal to 100 to 125 fpm, if we assume an equal distribution of air flow.

Maintenance Requirements

A major area of concern in selecting paint spray booths was maintenance requirements for adequate cleaning of all parts of the booth. Light fixtures, grates on floors and walls, and even air filter frames, were considered, and design arrangements were made to facilitate cleaning.

Water washing areas of these booths, and the subsequent eliminator plates and stacks, are normally in locations rising above the floor. If maintenance of these areas could be minimal, obvious advantages would be accrued.

In order to evaluate different manufacturers' booths in this regard, it was felt that a standard performance test might be established where personal observations could be made. Before elaborating on these tests, a brief description of the various types of booths we tested will be helpful in visualizing some of the problems in their selection.

Types of Paint Spray Booth Construction

In Fig. 1, the air flows into the back section, down into the floor grate and up through a single curtain of water.

In the booth shown in Fig. 2, air movement is the same as in Fig. 1, except that it passes through a double involute and a triple spray of water. This design proved to be most efficient, and was among the three or four designs finally accepted and installed. In this unit, as Fig. 2 shows, there is one eliminator plate above the involutes.

In Fig. 3, the unit is similar to Fig. 2 in back section design, with water spray directed downwards, except that there are two eliminator plates.

The unit shown in Fig. 4 is designed so that air passes through four curtains of water and changes direction four times through the involutes. This too was an efficient unit.

The back section of the booth shown in Fig. 5 is the most effective, having a vertical water supply spraying in two directions horizontally. However, this booth takes up to one third more space than the units previously mentioned, and is much more expensive than the conventional type of booth.

In general, the more elaborate the booth design, meaning the greater number of changes of direction taken by the pigment and solvent laden air, the more efficient the booth as a collector of these substances.

In Fig. 6 a typical back section is shown opened for inspection after a test run.

Standard Test Program

When any paint spray booth manufacturer wanted to submit bids on his booths, he was requested to run the approval test described below on his equipment.

First, the conditions were:

1. Rate of paint spray per 10 ft. section – 1.5 quarts/minute.
2. Viscosity of paint – 25 seconds in #4 Ford Cup.
3. pH range of compounded water – 9.0 to 10.0.

Under the conditions of air flow we desired, and test limitations cited above, a two phase check of

(Please turn to following page)

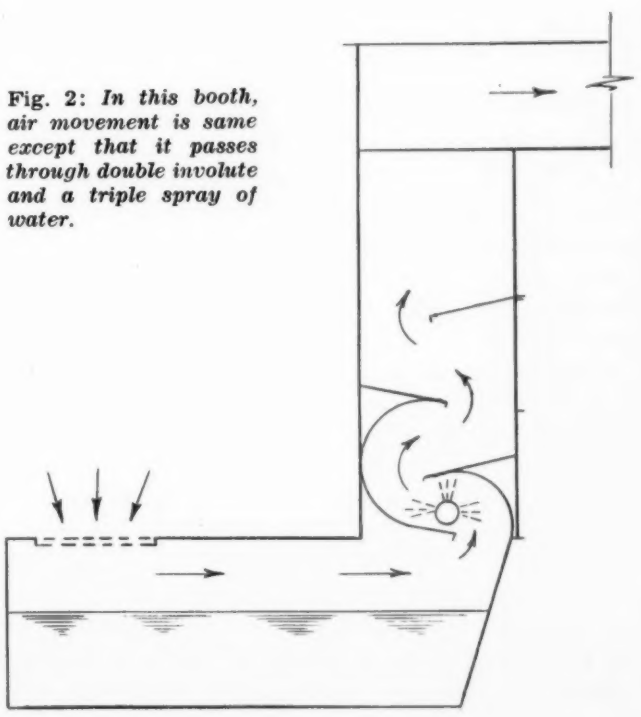


Fig. 2: *In this booth, air movement is same except that it passes through double involute and a triple spray of water.*

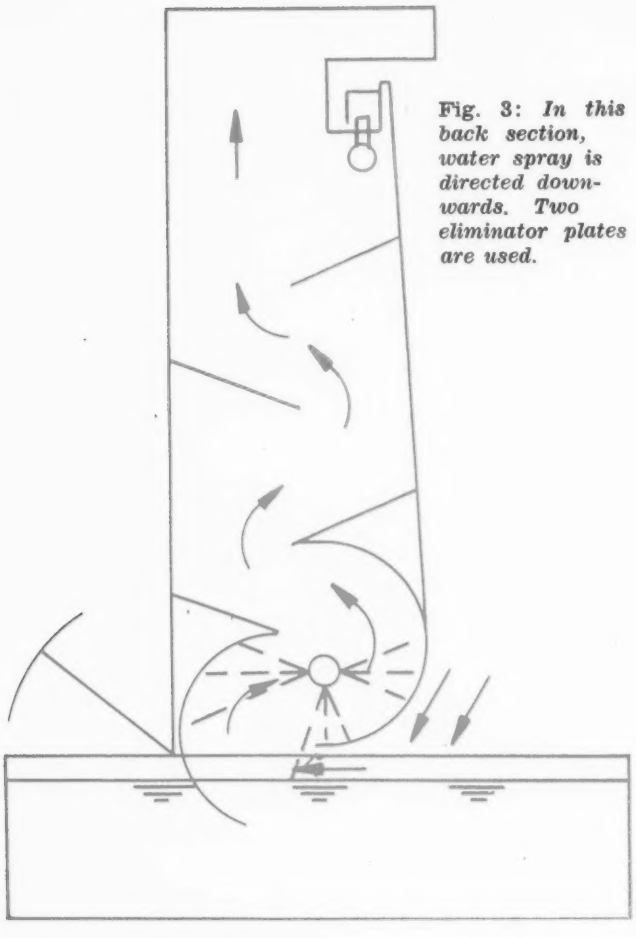


Fig. 3: *In this back section, water spray is directed downwards. Two eliminator plates are used.*

(Continued from preceding page)

the manufacturer's paint spray booths was made.

First the booth was approved or disapproved on the basis of pH tests, stickiness tests of paint deposits in the back sections, eliminator plates, and stacks. We were looking for good agglomeration of paint spray particles, and a complete lack of residual paint on eliminator sections and stacks, with water treatment held to the prescribed pH range.

Stack Emission Control Requirements

A requirement for solvent and pigment emission from the stack of paint spray booths was also made. Reason for such concern developed as our older equipment was asked to handle more and more paint spray jobs per unit time. We wanted to be good neighbors with the many people surrounding our many plants, by eliminating air pollution from this source. With this increased production, older booth designs allowed more paint laden air through back sections, out the stacks, and onto nearby areas. Cars in parking lots nearby were adversely affected.

Typical pigment and solvent loadings from an offending plant averaged the following during the tests:

8.4 grains/1000 cu ft with 310 ppm solvent load.

Based on previous work in stack sampling, we developed a testing technique to evaluate pigment and solvent emission concentrations. This technique permitted us to check efficiency of pigment and solvent collection by the paint spray booth under consideration.

In order to determine flow in the stack, a complete traverse of the paint booth stack was first made. Uniformity of flow is determined by means of such traverses. Uniform flow is desirable as an indication of good booth design, efficient use of stacks.

Normally, the sampling probe (Fig. 7) is used at three spots in the duct. One spot is centered, while the other two spots are at the one-quarter and three-quarter position, as long as velocities are approximately uniform.

Occasionally we found a duct or stack where a vane axial type fan was giving much higher velocities on one side than on the other. In these cases adjustments in sampling had to be made.

And sometimes, due to short distances from elbows where the probe was inserted, we found an uneven air flow. Again, adjustments were made in sampling in an effort to obtain sampling as close to iso-kinetic conditions as possible.

The typical sampling probe, meter, and the rest of the equipment appear in Fig. 7. Head of the probe is dismantled to show the two sizes and types of nozzles used in air pollution studies. These are the ¼ in. and ⅜ in. straight or tapered nozzles. The straight nozzle is used with a ceramic thimble, while the tapered nozzle is used with a paper thimble.

The paper thimble shown here is the collector we chose for determining pigment concentration. The paper thimble is dried overnight in a glass stoppered weighing bottle at 105 F. The entire unit of bottle and thimble is then cooled in a dessicator to room temperature. Combined bottle and thimble are weighed to a 10,000ths. of a gram. Entire assembly is dried again for four hours, dessicated and reweighed. This is repeated until successive readings within 2/10,000ths. of a gram are obtained. In more than 50 percent of the cases satisfactory weights are obtained in the first two readings.

After sampling, the thimble is replaced in the weighing bottle. The entire assembly is then dried, dessicated, and weighed to the constant weight (±2/10,000ths. gram). The difference in weight between the before and after thimbles is used in calculations with the cubic feet sampled in order to determine the grain loading per 1000 cubic feet of air.

We use an electrically operated Willson Pump capable of pulling 2 cfm of air in combination with the dry gas meter shown in Fig. 7.

Most tests for pigment on the job are continuous from 30 minutes to one hour. During that period from 24 to 60 cubic feet of pigment containing air pass through the thimble. The color of paint used is evident on the inside of the thimble.

Occasionally questions arise regarding the amount of paint pigment which collects in the nozzle of the sampling probe and never reaches the paper thimble.

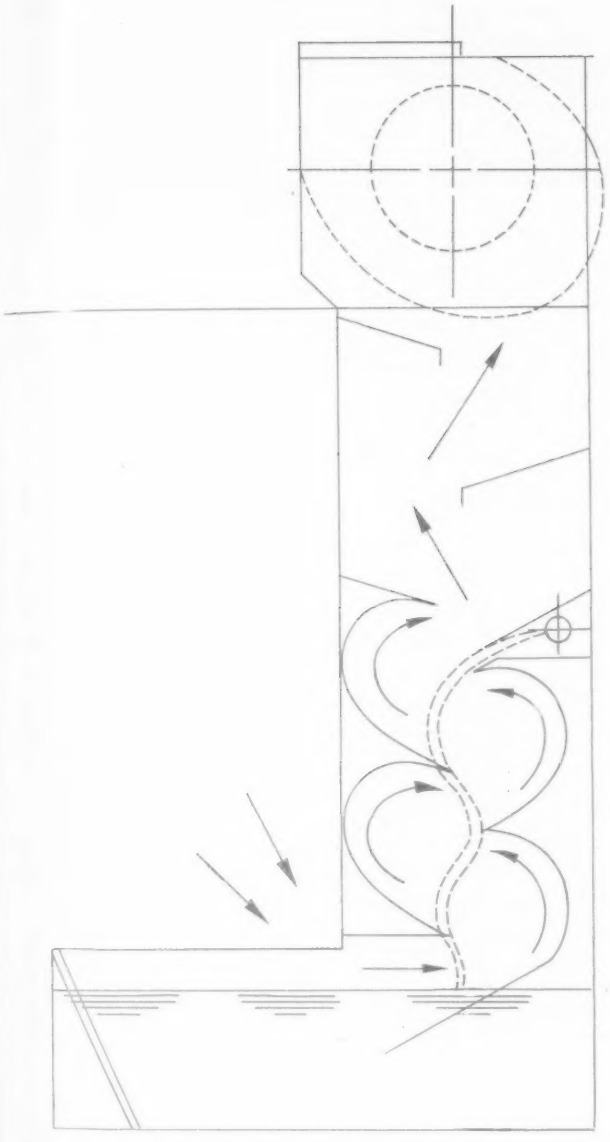


Fig. 4: *In this booth, air passes through four curtains of water and changes direction four times through involutes.*

One can occasionally observe a slight pigment deposit on this nozzle. However, it was found after continued observation of this area that the amount being caught prior to the thimble was of no major consequence.

The ceramic thimble has been discarded for this type of test because of the difficulties experienced in handling them. The incidence of breakage was high at almost every step in the test procedure. Besides the fragility of these thimbles, they have a tendency to clog up rapidly on some air pollution jobs. The three items in the lower right corner of Fig. 7 are a standard 2½ in. coupling flanked by two plugs, one of which is drilled to slide on the probe.

Before a stack is sampled for paint emissions, the standard coupling is inserted into the stack and welded into place. This simplifies the technique of sampling by keeping the probe properly aligned during the test.

The second stack emission of interest is the total solvent content. In all Ford tests our typical enamel solvents are used. We have previously calibrated a Davis Model M6 Vapotester with a 10:1 scale against this solvent in a 24 liter laboratory jar. During the regular pigment sampling program a series (3 to 6) of solvent vapor concentrations is made by sampling through a second hole in the stack. Except for the occasional high moisture content, stack results seem to be reproducible.

This program started in 1953 with results, obtained in subsequent years, being of sufficient number to provide value.

MANUFACTURERS' BOOTHS

Year	Number of Tests	Grain Loading Mean	Max.	Min.	Vapor Mean Concentration
1954	28	3.5	6.3	0.5	60
1955	6	3.4	4.5	2.1	60
1956	21	4.9	10.3	1.2	80
1957	44	7.7	27.1	1.8	150

In addition to these tests one manufacturer had a belt-back booth arrangement with the felt on rollers so that a new filtering area was presented gradually to the paint stream. The felt replaced the water wash section. Results of tests of this unit were as follows:

FELT BACK BOOTH

	Grain Loading			Vapor Concentration		
	Mean	Max.	Min.	Mean	Max.	Min.
2 Tests	2.4	2.7	2.1	425	750	100

(Please turn to following page)

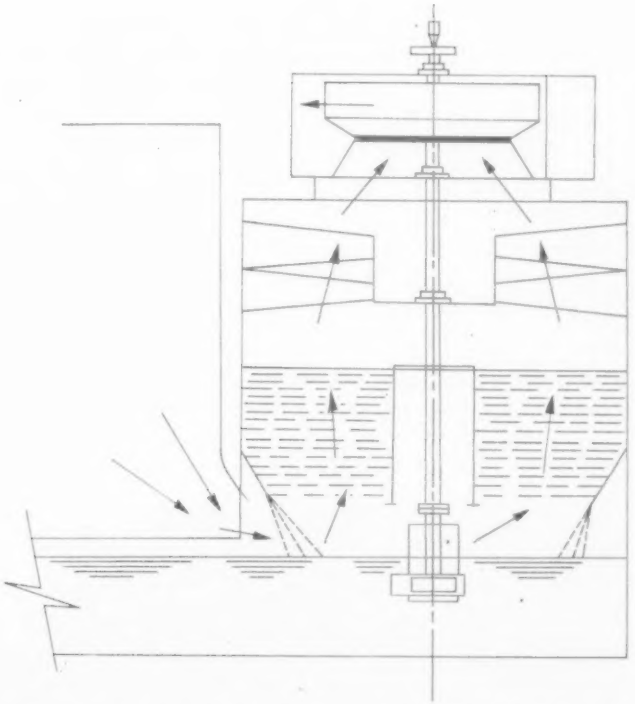


Fig. 5: *Most effective and more expensive back section has vertical water supply spraying in two directions horizontally.*

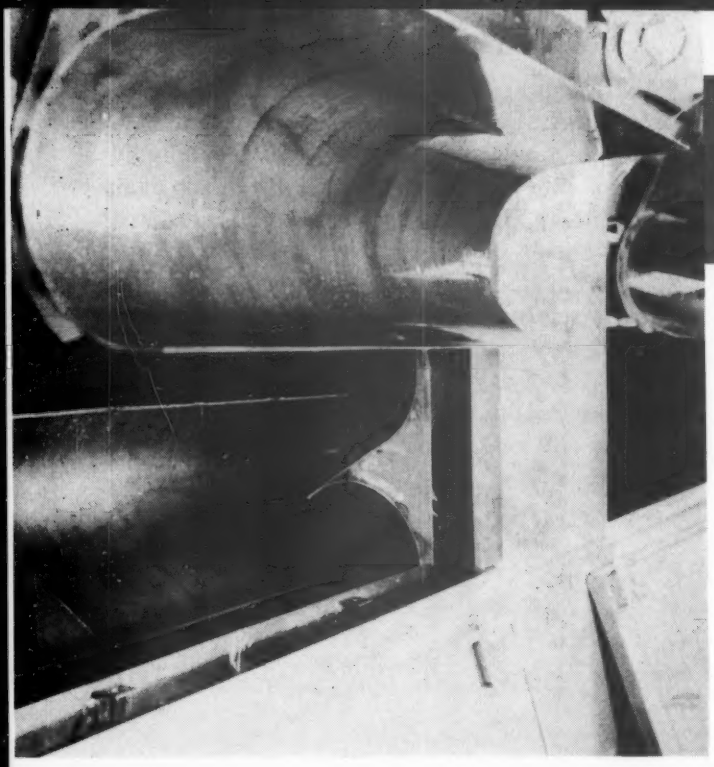


Fig. 6: Typical back section opened for inspection after a test.

(Continued from preceding page)

The standard adopted for the pigment and solvent values were less than 5.0 grains per 1000 cubic feet of air at STP and a vapor concentration of solvent below 100 ppm. Many manufacturers met this standard, yet others had difficulty reaching this level. As a point of interest, following is a chronological history of one manufacturer's tests during a period of seven months:

SINGLE MANUFACTURER'S TESTS

Month	Grain Loading Average	Solvent Average
1	6.7	150
2	9.1	210
2	9.5	250
2	10.0	300
2	6.3	270
5	4.9	120
6	6.4	250
7	2.0	50

During the period of these tests he made mostly minor changes in his back sections. It was only at the end when a basic change was instituted that this booth was approved for our use.

As a final point of interest, we ran a few tests of certain of these booths after they were installed at Ford operations. Following are a series of tests and the results obtained:

Number of Tests	Grain Loading			Solvent Concentration		
	Mean	Max.	Min.	Mean	Max.	Min.
6	3.6	4.5	2.4	80	150	60

During the period of testing manufacturers' paint spray booth back sections, we went from the east coast to the Chicago-Minneapolis area. A total of seven companies submitted sections for test. All qualified eventually. Only one qualified the first time tested.

This company has qualified any time we have tested them. Actually, the engineering personnel in this one company seems to understand the science of wetting and collecting particles the best. At least, they have proven it to us. ▲▲

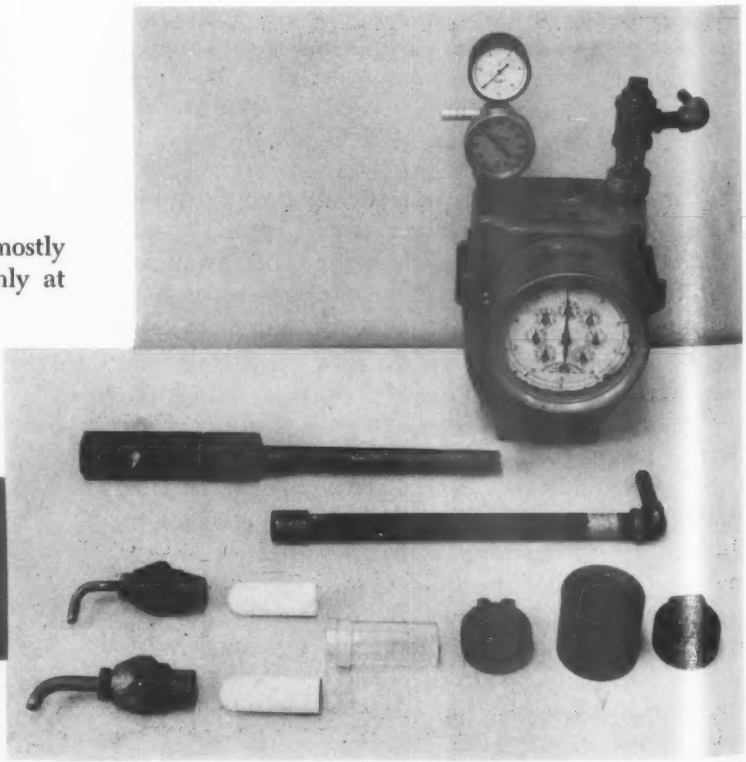


Fig. 7: Typical sampling probes and meter with heads of probes dismantled. From left across bottom are nozzles, filter paper thimbles, ceramic thimble, and fittings.

Reverse Jet Filters Back Down Dust

Here's how a Minneapolis firm overcame serious complaints from neighbors by installing high velocity, reverse jet dust filters in its grain elevator.

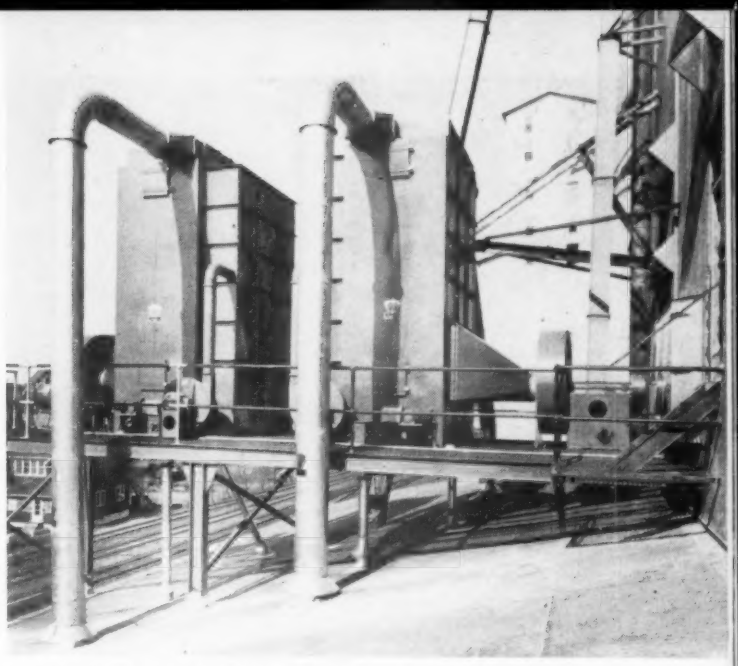


Fig. 1: *Twin installation of Day Co. high-pressure, reverse jet dust filter units installed to meet the air pollution mentioned in this article. A common housing for each double unit saved installation and housing costs. All illustrations for this article courtesy of Day Co.*

If yours is a dust-creating industry located near a residential area, what do you do when the neighbors complain that dust is settling on their homes, covering their automobiles and blowing through windows onto furnishings?

Off and on for more than 10 years a Minneapolis grain elevator, whose officers wish it to remain anonymous, was in such a predicament. When a wind blew, neighbors would voice their objections to the dust, created by the elevator operations, which was blown about the neighborhood. Elevator officials would then try to placate the neighbors by explaining the elevator's operations and by expressing sympathy.

"When we unloaded box cars we had fewer complaints," the elevator superintendent said, "but when we spouted grain into cars, it would hit the walls. A great deal of dust was created and carried by the breezes throughout the neighborhood. The situation was even worse when we loaded cars with grain dust for shipping out. During this operation it was almost impossible to breathe or see the person working within a few feet of you within the track loading shed."

Housekeeping for the elevator was also a problem. Grain dust would settle everywhere throughout the loading shed as well as blow in the windows and doors of the elevator proper, sometimes piling up to five inches in depth in the immediate loading area, the superintendent reported.

At one time, an attempt was made to remedy the situation by installing a "home-made" dust control system. Unfortunately it was improperly engineered and was not effective.

"When the suction pipe was placed in close proximity to the grain, it would pick up whole grain as well as the dust," the elevator superintendent said. "When the pipe was moved further away, the system was almost completely ineffective. In addition, this system by-passed the scales with the dust and short weights were registered. This, of course, wasn't at all popular with state officials, so the system was unusable and in operation only a short time."

In June of 1958 neighbors finally decided it was time to do more than complain. Ninety of them signed a petition demanding that the elevator take remedial measures. The elevator superintendent met

(Please turn to following page)

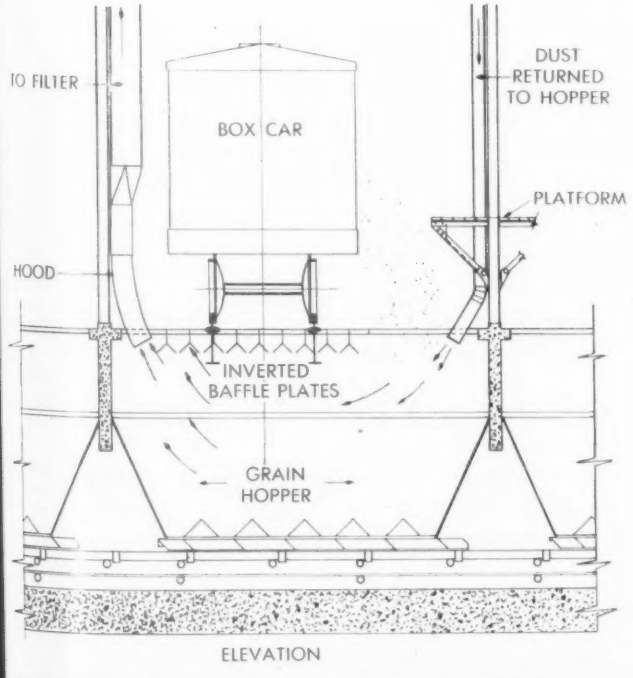


Fig. 2: *When a box car is being unloaded, grain fines are confined to area beneath grating and then drawn through hood and suction pipe into filter unit. Diagram also shows route of fines spouted back to the grain hopper. Car loading suction connection is not shown.*

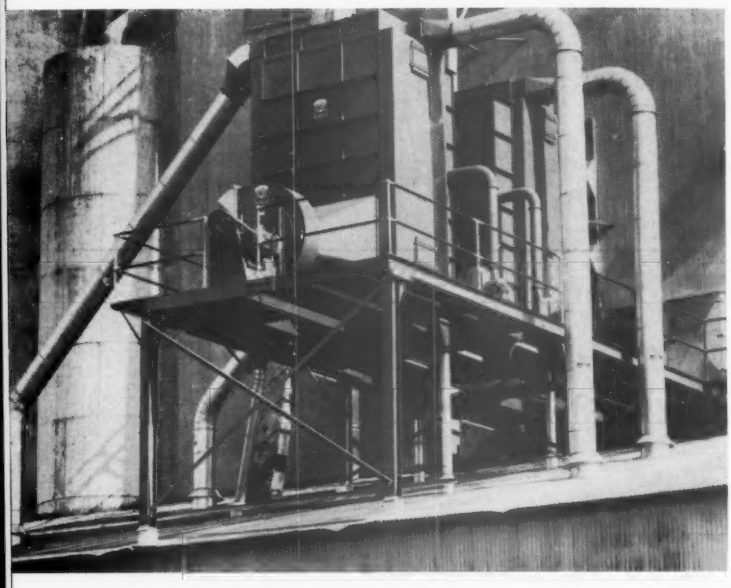


Fig. 3: *Photo shows dust tank at extreme left, as well as dust pipes rising through the roof of the track shed and connecting to both double filter units.*

captured and filtered in the same manner as in the unloading operation. During loading, however, the dust is fed into a separate suction system by means of another two-way valve. With this system the car is under a slight negative pressure that helps minimize escape of dust. Dust collected when loading cars is deposited into a special dust tank (Fig. 3).

The "heart" of this dust control system is the filtering units, of the high velocity, reverse jet type.

Here's how these reverse jet dust filtering units work:

Dust laden air enters the filter tube section. There are 24 filter tubes in each filter in this installation. As the air passes out through the tube, heavy felt traps dust while air flows in uniform volume through felted media. In ordinary filter cloth, fine dust often seeps through pores and intermittent rapping or shaking for cleaning causes staggered pressure drops which result in fluctuating air volumes and lower efficiency. With the reverse jet type filter, dust which is collected on the inner wall of the filter tube is moved by rings which blow "reverse" air

(Please turn to page 51)

(Continued from preceding page)

with the signers of the petition in an attempt to pacify them, but the next day they took their complaint to the ward alderman.

At the alderman's request, Malcolm E. McLouth, chief air pollution control engineer of Minneapolis, consulted with elevator officials and explained that unless corrective measures were taken, the elevator would face a nuisance charge.

That's when a dust control company was called in to survey the elevator's needs. Upon its recommendation and with approval by the city, two double, housed-type, high-pressure, reverse jet dust filter units (Fig. 1) were installed on the track shed roof above four box car loading areas. Half of each double filter unit takes care of the dust control needs for one car.

When a box car is unloaded, a dust hood rests on the grain hopper grating. Dust which normally "boils" up from the hopper is confined to the hopper area due to downward travel of air. The dust is then picked up by the hood (Fig. 2) and carried through the dust pipe to a filter unit on top of the shed. The dust is then removed from the air by the filter. The dust which is collected is returned to the grain hopper. Because the dust is returned, the problem of shortages is eliminated.

Patented inverted baffle plates under the grating control air movement into the hopper. In this way effective suction is secured with a minimum amount of air being handled.

In the case of a car being loaded, a flexible tube, controlled by a two-way valve, is connected to a dust pipe and placed on the coopering of the car door. The system is placed on suction and dust is

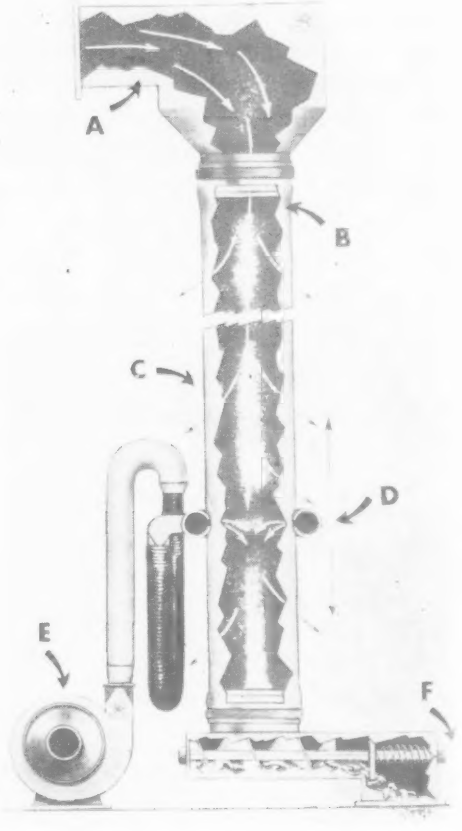


Fig. 4: *Cut-away view shows filter operating principle: (A) square-to-round inlets eliminate dust-catching ledges; (B) dust-laden air travels downward to take advantage of gravity in settling dust; (C) air leaving filter tube is dust free, keeps moving parts free from dust; (D) self-adjusting reverse jet blow rings travel continuously up and down filter tube dislodging dust; (E) centrifugal blower provides positive, fixed air volume; (F) continuous airlock type screw conveyor discharges dust.*

by C. O. Wood
Manager, Engineering Laboratory
Westinghouse Electric Corp.
Sturtevant Div.

For the air engineer

Techniques for Designing Duct Systems

PART II

In this second article in a continuing series, the author describes velocity reduction and equal friction methods of determining air flow requirements in duct systems.

THERE ARE A NUMBER OF METHODS USED FOR DESIGNING a duct system. The method selected depends largely on the requirements of the application. A shortcut or approximate approach may suffice for small systems which are not critical for noise or air distribution.

Larger systems may benefit considerably by a detailed design method. Here, substantial horsepower savings can be realized and the overall system operation can prove much more satisfactory by close attention to details.

The proper duct design will result in an economical and satisfactory fan selection and will also contribute to the satisfactory performance of the overall system.

The losses in the system are calculated for the purpose of fan selection. They include losses due to various equipment such as heat transfer coils, filters, air washers, diffusers, and grilles in addition to the frictional and dynamic losses in the duct itself. (See "Tips on Duct Design" in November issue of AIR ENGINEERING.) The velocity pressure of the air leaving the supply outlet is a loss and must be included as such.

The sum of all the system losses is taken as the requirement for static pressure rise across the fan and is used for fan selection. Actually a more accurate description of fan performance is the total pressure rise across the fan.

This includes the difference of velocity pressure leaving and entering the fan in addition to the static pressure rise. However, this additional performance is usually neglected since space requirements seldom permit the full conversion of velocity to static pressure at the fan outlet.

The first step in designing a duct system is, of course, to determine the air flow requirements to the various rooms on the basis of heat load and air distribution. From this, then, the total and individual air requirements become known, and the preliminary duct layout can be spotted on the building plans.

(Please turn to following page)

Table 1

RECOMMENDED VELOCITIES IN DUCT SYSTEMS

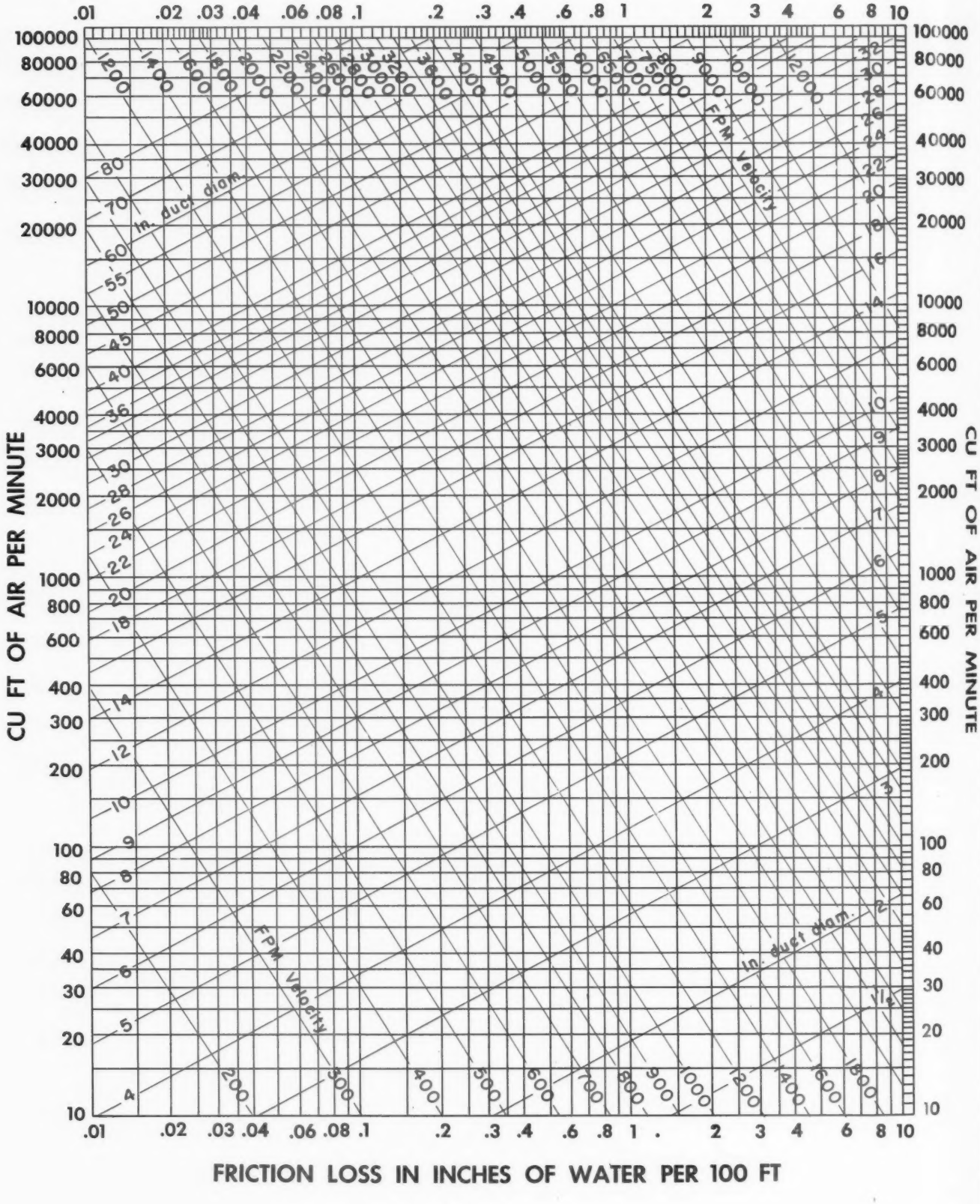
Equipment	Velocity Range fpm Low Velocity Systems	High Velocity Systems
Outside Air Intakes*	300-1500	300-1500
Filters*	300-1000	300-1000
Heating Coils*	300-1000	300-1000
Cooling Coils*	300-700	300-700
Air Washers	500-750	500-750
Fan Outlets	1300-2800	1300-2800
Main Ducts	1000-2400	2500-4500
Branch Ducts	600-1600	2000-4000

***Notes: These velocities are based on total face area, not net free area.**

Velocity at outside air intakes is usually kept low to prevent entrainment of rain.

If noise is critical it is best to hold to lowest velocities in each range.

Chart 2



(Continued from preceding page)

1) *The velocity reduction method* is the most straight-forward design method. However, it is approximate and should be used only for simple systems. It consists of selecting velocities for various duct sections in conformance with best practice for the application.

The highest velocity is at the fan outlet with successively lower velocities downstream as air is removed through branch ducts or outlets. Table 1

shows recommended velocities as a guide.

The area of each duct section is found simply by dividing cfm by velocity.

The pressure against which the fan must operate is found by adding all the losses in the longest or most complicated length of duct.

2) *The equal friction method* implies the same friction per unit of length for all duct sections. The main duct velocity is selected according to the best practice for the type of system and noise requirements. This velocity should be less than the fan outlet velocity. Refer to the air friction chart, Chart 2. At the intercept of velocity and cfm, note the friction loss per 100 ft.

Now, progressing down the main duct, the cfm will be reduced as air is drawn off in the branch ducts. Resize the main duct at these takeoff points by reading from the friction chart the duct size corresponding to the lower cfm and the same friction loss per 100 ft. It will be noted that this results in a lower velocity than in the preceding main duct section.

Important To Find Static Regain

An important step at this point is to determine static regain at each change of duct area. This step becomes more necessary in systems with high duct velocities.

At each change in duct section air velocity is reduced. There is therefore some excess velocity head which will be converted to static pressure. The amount of this static regain is taken as ½ the theoretically possible regain. Thus:

$$\text{Static pressure regain} = 0.5\,\rho\left[\left(\frac{V_1}{1096.5}\right)^2 - \left(\frac{V_2}{1096.5}\right)^2\right] = \text{inches of water.}$$

or for standard air:

$$\text{Static pressure regain} = 0.5\left[\left(\frac{V_1}{4005}\right)^2 - \left(\frac{V_2}{4005}\right)^2\right]$$

V = *Velocity in fpm.* ρ = *air density lbs/cu ft.*

Static regain at each branch takeoff along main duct is deducted from losses of main duct.

Pressure at fan outlet is next determined by adding losses in main duct section all the way out to last outlet.

These losses will include duct friction, dynamic losses in elbows, transitions, conditioning equipment, etc. and loss at the last outlet. Loss at the last outlet is duct velocity head $\left(\frac{V}{1096.5}\right)^2 \rho$ plus static pressure loss for diffuser or grille. Latter value is obtained from manufacturer.

In case of high velocity attenuator-diffuser combinations this loss is listed as minimum static pressure required to produce stated air flow with valve wide open.

Now static pressure at each branch duct can be determined by deducting loss between fan and branch from static pressure at fan. Branch ducts can be designed using same friction per unit length as main duct.

However, a more refined and more satisfactory method is to size branch so that total loss (diffuser plus duct loss) is equal to static pressure at branch entrance.

This produces a more gradual drop in pressure, relieving outlet damper, and resulting in less noise and smaller duct. ▲▲

Next: *Fan Selection Simplified.*

SUGGESTED REFERENCES:

ASHAE Guide: American Society of Heating, Refrigerating & Air Conditioning Engineers, New York City.

ASRE Data Book: American Society of Heating, Refrigerating & Air Conditioning Engineers, New York City.

High Velocity Duct Design: Anemostat Corp. of America, New York City, 1957.

How You Can Put Air To Work: Westinghouse Electric Corp., Sturtevant Div., Hyde Park, Boston, Mass.

Marks Handbook: McGraw Hill Publishing Co.

Wilson, C. M.: "Handbook of High Velocity Air Distribution Design," Heating Piping, Air Conditioning, Vol. 26, Nov. 1954.

Useful Data: Application Data Pamphlet 1000. Westinghouse Electric Corp., Sturtevant Div., Hyde Park, Boston, Mass.

Don't be disappointed next month - - -

Send in your subscription NOW for

AIR ENGINEERING

Write on your letterhead or use the handy order card in this issue. Be sure and state your company affiliations and job title.

Circulation Manager

AIR ENGINEERING

450 West Fort Street

Detroit 26, Michigan

1 year, $3.00 — 2 years, $4.50 — 3 years, $6.00

Survey Indicates VAST

Air Cleaning Equipment Market

THE MARKET FOR AIR CLEANING EQUIPMENT reflects the amount of air cleaning required in each of our major centers of industrial activity.

To try to point up the overall market for air cleaning equipment, the editors of AIR ENGINEERING asked the people most concerned with air pollution on a local basis, the appointed control official, to answer three questions:

1. About how much would it cost in terms of control equipment to reduce air pollution in your area . . .
   a. To Ideal Conditions
   b. To Acceptable Conditions
2. About how much do you estimate has been spent in your area for air pollution control equipment during the past two years?
3. How much do you estimate will actually be spent for air pollution control equipment during the next two years?

Answers to these questions, from air pollution control people, are summarized in Table I.

While Table I covers 12 cities and one county, and is therefore hardly a good statistical sampling of all cities in the country, the survey shows a need for $498 million of air cleaning equipment in these cities alone.

Projecting this estimate by any known statistical method would indicate a market for billions of dollars of air cleaning equipment on the basis of the need for such equipment at this time.

Whether or not the air cleaning industry can *sell* this amount of air pollution control equipment will of course be a factor both of the efficiency of air pollution control people, the backing given these officials through enabling legislation, the degree of cooperation by industrial management, and the establishment of realistic MAC's for industrial dusts in the external environment.

TABLE I—The Market for Air Cleaning Equipment in 12 Cities and One County

	THE MARKET		ACTUAL EXPENDITURES	
CITY	How much equipment needed to reduce air pollution to ideal conditions?	To Acceptable conditions?	How much has been spent for control equipment during past two years?	How much will be spent for air cleaning equipment during next two years?
Birmingham, Ala.	$10,000,000	$8,000,000	$1,000,000	$1,000,000
Evansville, Ind.	10,000,000	1,500,000	300,000	200,000
Louisville, Ky.	25,000,000	15,000,000	2,500,000	3 to 5,000,000
Columbus, Ohio	25,000,000	18,000,000	2,000,000	1,500,000
Minneapolis, Minn.	7,000,000	3,000,000	200,000	300,000
Milwaukee, Wisc. (1)	50,000,000*	10,000,000**	1,500,000†	2,000,000‡
Cincinnati, Ohio (2)	3,000,000	1,500,000	300,000	300,000
Wheeling, W. Va. (3)	2,000,000	1,000,000	1,750,000	500,000
Chattanooga, Tenn. (4)	15,600,000	7,000,000	50,000	100,000
East Chicago, Ind. (5)	300,000,000	150,000,000	10,000,000	6,000,000
Allegheny County, Pa. (6)	50,000,000	40,000,000	3,500,000	7,000,000
Honolulu, Hawaii	450,000	360,000	254,000	3,877,000
TOTALS	$498,050,000	$255,360,000	$23,354,000	$27,777,000

(1) *Ideal—Assuming reasonable automatic control systems are developed.
**Acceptable—Excluding automatic control.
†½ of this on 3 large projects.
‡Will be influenced by 5 or 6 large projects.

(2) This estimate is for eight communities which border Cincinnati—some 25 sq. miles and 22,000 people plus approx. 250 industries.

(3) For Wheeling only. Most of the heavy industry is located out side of the city limits.

(4) This area is in bad need of equipment to control air pollution, because of the number of big foundries in the area. Not enough is being done by the foundries to combat air pollution.

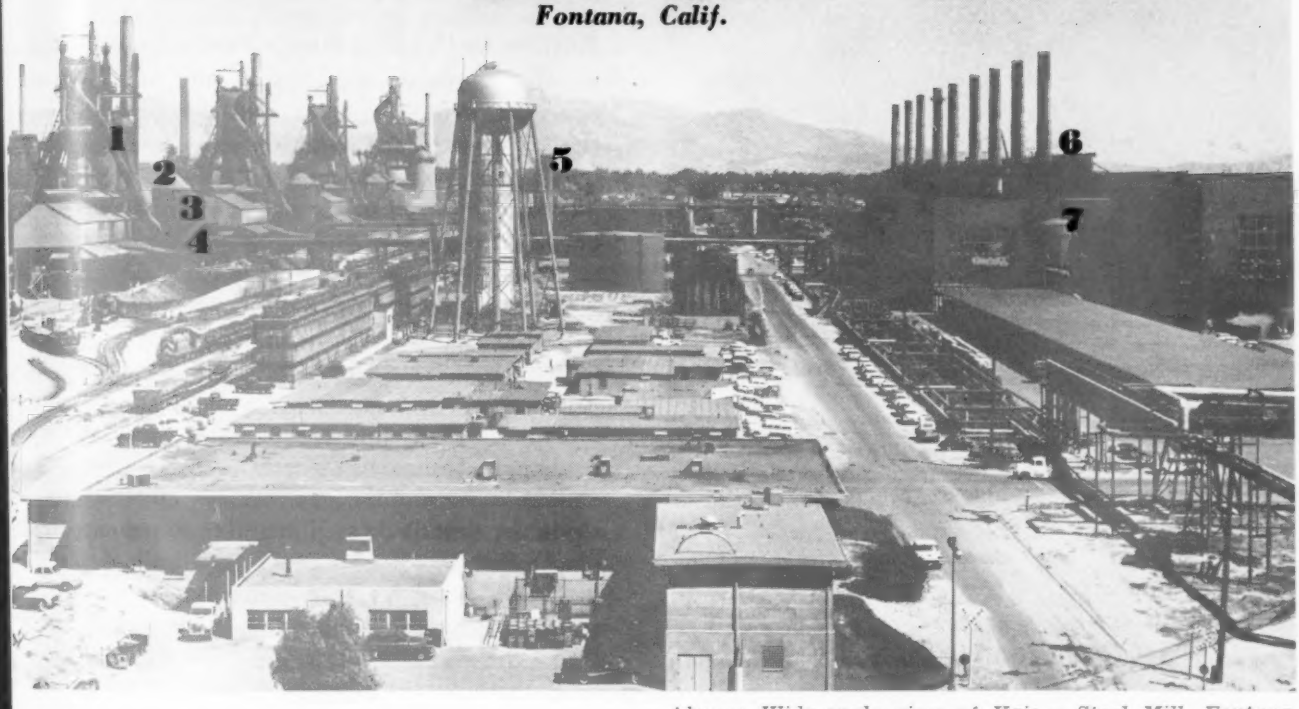
(5) It has been estimated in 1958, that to control the open hearth furnaces alone it would cost the two steel mills over $59,000,000, at about $700,000 for equipment for each furnace.

(6) After having expended a great deal of time in analyzing the air pollution situation in this area from the point of view of the questions accompanying your letter of September 16, we are sorry to say that we have not been able to come up with any positive figures. We have, however, filled out the questionnaire. Your questions 1 and 2 are fundamentally unanswerable without a definition of the words "ideal" and "acceptable".

The amounts set forth in your questionnaire which is being returned herewith, are the best guess that can be made at this time. The amounts given cover equipment only and do not include the cost of installation or other work made necessary.

Coast's Largest Steel Plant Keeps Air Clean

by Jack Smith
Director of Air Pollution Control
Kaiser Steel Corporation
Fontana, Calif.



Above: *Wide-angle view of Kaiser Steel Mill, Fontana, Calif., shows plant in full operation without noticeable air pollution. Air cleaners are installed where noted by number:* 1. *Downcomer,* 2. *Dust catcher,* 3. *Scrubber,* 4. *Electrostatic precipitator,* 5. *Desulphurizer,* 6. *Electrostatic precipitator (one per furnace), and* 7. *Baghouse.*

Part II concludes story of how Kaiser Steel works to control air pollution in its Fontana plant and keep its neighbors informed and happy.

FROM THE OUTSET OF OPERATION of a Cottrell precipitator on No. 3 open hearth furnace at Fontana, it became evident that stable optimum gas cleaning performance on a large hot metal-charged furnace was a more difficult and complex problem than that experienced by other steel companies in the cleaning of small, cold metal-charged furnace stack gases.

Preliminary tests run on this equipment indicated that extensive research had to be made to determine the factors influencing optimum performance. The program, conducted jointly by Kaiser Engineers and Western Precipitation Corp., investigated all phases of the gas cleaning problem.

Under actual operating conditions the effects of temperature, moisture and conditioning agents and their relation to the apparent resistance of dust and fume to an electric charge were studied. A pilot plant was installed in the open hearth shop to obtain additional data.

In addition to on-the-site work, scale model water flow units were tested in the research laboratories of Western Precipitation to study the gas flow characteristics of various parts of the cleaning system.

Months of exhaustive research led to modifications in the precipitation on furnace No. 3. Finally the unit operated within the exit dust loading guarantee called for by the specifications. But the data collected indicated that future precipitators should be 50 percent larger to insure satisfactory performance. Subsequent precipitators were so designed.

By July, 1957, all nine open hearth stacks had been controlled by nine precipitators at a total cost of $5,500,000. The units were all Cottrell electrostatic precipitators built to the specification of Western Precipitation Corp. Rated at a capacity of 58,500 cfm (inlet conditions) and requiring 75 kva,

(Please turn to following page)

Coke ovens are an inherent air pollution problem with their high temperatures and heavy dust loading. At Kaiser Steel, incentive pay, self-sealing doors, and rotary table larry cars have minimized the problem.

(Continued from preceding page)

the precipitators successfully collected 90-95 percent of the dust and fume leaving the furnace.

A large "press party" was held to mark completion of the project, and newspapermen and civic leaders watched an "on-off" demonstration. Their reaction was very favorable.

Meanwhile, efforts at air pollution control were not aimed just at the open hearth furnaces.

Problem at Car Dumpers

At Kaiser Steel, all raw materials are brought into the plant in railroad cars. They are unloaded individually by two rotary car dumpers, one for coal and one for iron ore. These dumpers turn the cars over, allowing the 65 and 100 ton loads to fall onto belts below. Naturally, this created an air pollution problem – especially at the coal dumper.

The problem was solved by equipping the plant's two car dumpers with Johnson March spray systems. A detergent was added to the water used in the spray system to provide adequate wetting of coal dust, resulting in a dust reduction of 65-70 percent.

The same type system has also been successfully incorporated in the coal handling facilities at each blast furnace, resulting in a dust reduction of 50-88 percent, depending upon operating conditions.

A new hammer mill building in the coal handling area was installed where coal for making coke is broken up into small particles before charging into the coke ovens. This type operation usually liberates an extremely fine coal dust. A baghouse was installed and eliminates this operation as an air pollution source.

The coke ovens were always a problem, despite the self-sealing doors and rigid "practices" used at Fontana from the beginning. In an attempt to alleviate this problem, Kaiser Steel installed an incentive program for coke oven employes, the only such program this writer knows of in the industry.

Employes Paid To Keep Ovens from Smoking

The employes are paid a premium for keeping the coke ovens from smoking. Photographers from the air control and research department make frequent trips to the ovens to check for smoke. If the pictures show clean ovens, the employes involved get more pay.

When two new batteries of Koppers coke ovens were installed early this year, they were equipped with 180 self-sealing, screw latch doors at a cost of nearly $1 million. All other known air pollution control devices were incorporated in the new batteries, including rotary table larry cars for near-dustless coal feeding to the ovens.

The dust catchers, gas washers and wet type precipitators installed as integral components of the plant's first blast furnace were also built into the second, third, and fourth blast furnaces as they were added during the years.

In the foundry, it is necessary to remove sand from the castings, and in so doing clouds of dust were emitted into the air. An air cleaning system consisting of five Rotoclones was installed to minimize this problem.

At the various shops throughout the plant, many types of control devices have been installed, including a cyclone at the carpenter shop, collectors at the machine shop, and spray paint booths at the paint and electrical shops.

All reheating furnaces at the plant's rolling mills are under constant check to keep effluents at a minimum. The pickling line at the tin plate mill is guarded by a mist eliminator and acid trap.

Testing Pilot Models for Sinter Plant

At the sinter plant, technicians are in the process of gathering engineering and design information by testing of pilot models under actual conditions. Units being tested include a wet-scrubber, two types of baghouses and an electrostatic precipitator.

Here, as in all areas of the plant, Kaiser Steel scientists are not only concerned with visible effluent but also with those things which might in the future become problems – whether gaseous or particulate.

Some headaches have been encountered in several areas in the battle against air pollution. In the continuous weld pipe mill, the galvanizing unit has been a constant source of trouble.

A cyclone was installed to filter the fume but has been only 60 percent effective. Bag filtration techniques resulted in fires and explosions. However, experimentation goes on to increase collection efficiency.

At the start of this year Kaiser Steel installed three oxygen steelmaking furnaces at its Fontana plant, nearly doubling its capacity to the present 3 million ingot tons per year. Because of the speed with which these furnaces refine molten pig iron to steel, the dust loading of the emerging gases is extremely heavy.

To meet this problem, Research-Cottrell furnished three dry type electrostatic precipitators at a cost of $5-million to remove the fumes and dust collected by hoods. This installation is the largest smoke control device of its kind in the world.

Over each of the three furnaces is a water cooled hood, 46 ft. high and 11½ ft. in diameter. Hot gases passing through this hood are cooled from 3200 F to 560 F by a water spray. Over each hood is a 20 ft. by 12 ft. by 50 ft. high evaporative chamber. After this is a 16 ft. by 10 ft. by 45 ft. high arrestor which captures large particles of dust.

A horizontal flue, 12 ft. in diameter, conducts the gases from this particle arrestor to the precipitators in a separate building adjacent to the production shop. Each precipitator handles a gas flow at the peak of "blow" of 405,000 cfm. Dust particles collected by each precipitator are processed for recharging into the blast furnace.

Each of the three precipitators is equipped with an induced draft fan which discharges the cleaned gases into stacks.

How Air Control and Research Department Is Organized

Meanwhile, the air control and research department of Kaiser Steel continues its day-to-day efforts to make the steel plant cleaner.

At the present time, there are 21 scientists and technicians working full time on air pollution problems. For efficiency, the department has been broken down into three subdepartments: agricultural, engineering, and chemical.

The agricultural unit is responsible for observing and sampling vegetaition at regular stations throughout a 1600 square mile area. Samples of forage, such as alfalfa from local farms, orange leaves from citrus groves, and pine branches from nearby mountains are brought to the air control laboratory for analyses. While the number and location of these sampling stations fluctuates from time to time, there have been as many as 79 in use at one time.

In addition, consultants make occasional checks on local vineyards to inspect for air pollution symptoms on grape vines.

The agricultural technicians also maintain four greenhouses in and around the plant for various programs. These greenhouses can have their atmosphere filtered, ambient (with nothing removed from the atmosphere), or fumigated, in which air is completely filtered but controlled amounts of suspected pollutants are injected, such as fluorides or oxidants.

The engineering unit is chiefly responsible for devising and testing air pollution control equipment. At the present, they are operating the previously described pilot equipment on the sinter plant. They are also conducting a program to further reduce the fluoride emissions from the open hearth stacks.

Fields of study evolved in air pollution engineering problems are quite numerous. They include such things as the nature and amount of stack effluents, dust fall measurements, dust concentration measurement, automatic atmospheric gas sampling, greenhouse air filtration and greenhouse fumigation equipment. Each of these studies involves different equipment which is often not on the market and must be designed by plant engineers.

Kaiser Steel air control engineers also operate four air sampling stations. These stations were originally designed to determine SO_2 content in the atmosphere, and were equipped with Thomas autometers to do the job.

A Kruger air sampler was recently added at one of these stations, however, to provide readings of oxides of nitrogen, oxidants, and total sulfur as well as SO_2.

The chemical unit performs the analytical work for both the engineering and agricultural sections.

(Please turn to following page)

This atmosphere provides readings of oxides of nitrogen, oxidants, sulphur dioxide, and total sulphur. It is located in a vineyard close to the Kaiser plant.

(Continued from preceding page)

In addition to performing the detailed micro-analysis, the chemists also assist the engineers in specifying sampling and testing requirements.

To accomplish this, the chemical unit has its own lab with all equipment necessary for the exacting job of determining minute concentrations.

Joins Agricultural Research Program

Early this year, Kaiser Steel took another step in its agriculture program. The company joined with Sunkist Growers, San Bernardino County, the University of California at Riverside, and other interested groups in planning an Agricultural Air Research Program.

Original plans call for a six-year program to study the effects of oxidants and fluorides on citrus trees, with financing and policy coming from the interested parties.

According to A. M. Boyce, director of the Citrus Experiment Station at the University, the new project will be unique in the history of air pollution research.

"This is the first cooperative effort by industry, agriculture, government, and a university to assess the threat of air pollution to farm production efficiency," Dr. Boyce said.

"It is also the first attempt anywhere to measure precisely in the field the effects of atmospheric pollutants on growing crops."

Total estimated cost of the program is $1,143,000.

Meanwhile, the public relations department of Kaiser Steel has kept the plant's neighbors aware of the complexities of the problem and the progress made toward solving them.

Late in 1952 an educational public relations program dealing with the subject of air pollution was initiated. Periodic reports were made to newspapers in 17 communities telling of Kaiser Steel's progress.

Invitations were extended to city, county, and state officials; civic groups; farm bureau organizations; executives of other industries; college and university professors; and other interested individuals to tour the facilities and see what had been done.

The editor of the plant newspaper ran a series of articles on air pollution, explaining the facts to the employes and their families. Reporters conducted a survey of employes to see if any specific questions existed which were not explained in the articles. Every question asked by an employe was answered in the next issue of the paper.

Strike Proves Plant Doesn't Cause Smog

In 1955, a strike closed the Fontana mill for several days, during which time an unusually heavy smog blotted the plant from view. Photographers snapped pictures of the moving bank of smog as it rolled in from the West over the shut down plant.

When the pictures were printed in the newspapers later, they were graphic proof for many people that Kaiser Steel was not a major cause of the so-called smog problem.

In 1954 and 1957, when the first and last open hearth precipitators were completed, civic leaders and members of the press were given "on-off" demonstrations. In press conferences later, they were told of Kaiser Steel's progress in other areas of air control and research.

Last year the plant's motion picture department made a film called "Air Pollution – Everyone's Problem," a 17-minute, color film which describes the problem in layman's terms.

As a result of this continuing campaign to keep the public informed, the citizens of the area are becoming more understanding and tolerant each year. Most of Kaiser Steel's neighbors now realize that air pollution is a complex problem, requiring time and research to be solved.

Henry J. Kaiser's directive to "keep the plant from ever becoming a nuisance to its neighbors" has resulted in what we believe to be the nation's cleanest steel mill.

More than $15 million has been spent on air control and research at Fontana since 1942, but more significant is the fact that the work and research and progress goes on. ▲▲

How To Achieve Air Diffusion Without 'Ceiling Clutter'

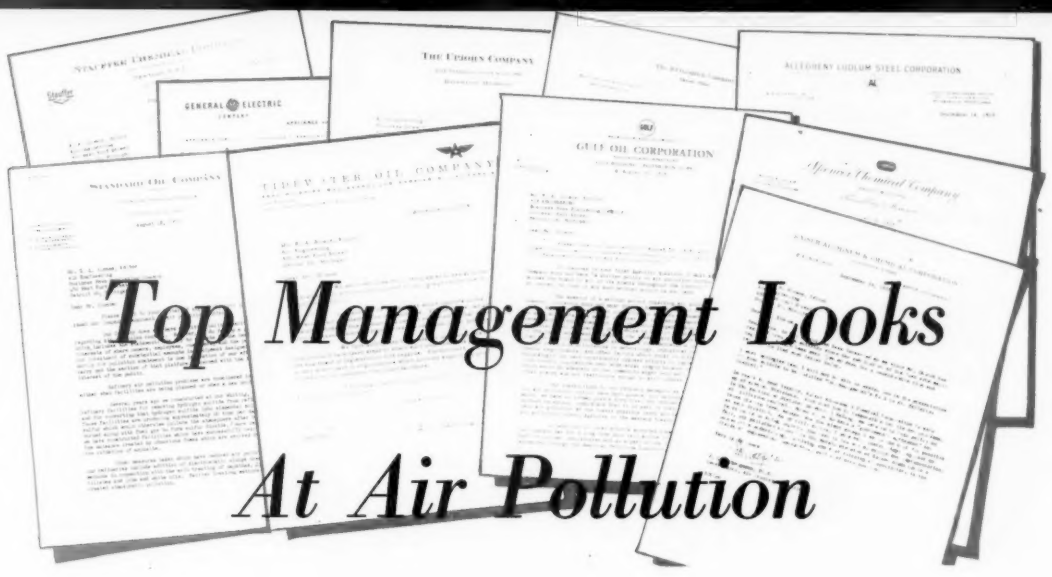
How would you design a lighting and air diffusion system for an immense 28,000-sq.-ft. general office area without destroying the clean sweep of an attractive metal pan ceiling?

This was a problem that recently confronted the builders of Graybar Electric Co.'s new Central District Headquarters in Melrose Park, Ill., the largest combination warehouse and sales office in the firm's network of over 130 cities.

The problem was answered by a technique that "disguises" the air diffusers within flush-mounted fluorescent ceiling light fixtures. The glass-bottomed unit is equipped with tiny side slots which transmit a vertical air flow from a low velocity air diffuser mounted above the light. The diffuser, by means of a valve mechanism, slows the speed of the air coming from a flexible tube attached to a central duct.

Because only the glass plates are visible from below, the ceiling retains a completely unbroken sweep from end to end. ▲▲

EQUIPMENT CREDIT
Diffuser—*Multi-Vent Div., Pyle-National Co.*



Top Management Looks At Air Pollution

What is your company's policy on air pollution? Here are the policies and attitudes held by some of the nation's top firms on this important subject of air pollution from industrial processes.

When local civic organizations and newspapers aim pot shots about air pollution at an individual factory, the man usually most exposed to criticism is the plant manager.

The plant engineer (he may be you) is frequently caught between complaints by an aroused citizenry and determination of his top management to avoid spending money on non-productive capital equipment.

Some years ago a clear picture of this difficult situation was described by G. Edward Pendray [1]. Pendray called this dilemma "The Air Pollution Syndrome". A syndrome is a collection of symptoms specific to a disease or malady.

According to Pendray, the Air Pollution Syndrome takes this form: The works manager of the local plant may be the old-fashioned type who believes in maximum production with minimum capital investment without a thought to air pollution. Complaints about smoke, fly ash, or nauseating odors may first reach him through his closest friends.

If he were to buy enough air cleaning equipment to do the job, our plant manager foresees the year's profits vanishing with the pollution.

When his friends lay their complaints before him, he blandly tells them that *his* factory is not polluting the air. Yet one can see from his office window billowy clouds of black smoke pouring from the stacks of his plant.

When his ex-friends persuade civic groups and the legal brains of the community to take up the cudgel, he retorts that this is the price of progress. If the city wants the benefits of industrial employment, its citizens must learn to live in an industrialized community.

This statement, coupled with his previous ostrich-like attitude, makes everybody angry. The newspapers run pictures of his plant, comparing it with similar factories that have cleaned up their air pollution problems.

When the committee from civic groups call on our plant manager, hoping to bring him to reason, they face a battery of legal counsel which has advised no positive statement which may constitute an admission that a problem exists.

At this point, management plainly acts in a guilty fashion. What started as a friendly discussion between the plant manager and his concerned friends winds up as a local crusade against the plant, as a legal battle, or as a demand for legislation to force the plant manager to clean up his air.

Along the line, production suffers because plant

(Please turn to following page)

REFERENCE

1. Mallette, F. S., "Problems and Control of Air Pollution." New York, Reinhold Publishing Co., Inc., London, Chapman & Hall, Ltd., 12 (1955).

(Continued from preceding page)

morale becomes low. Employes feel they have to justify working in such a plant to their friends.

We, the editors of AIR ENGINEERING, believe this "Air Pollution Syndrome" is fast disappearing from the scene of industry in this country.

We recently asked management of some of the largest industrial firms in this country about their policy, expressed or implied, on air pollution. Their replies reflect a more humanitarian approach to industrial growth.

Here are some of the answers we received:

What Management Says About Air Pollution Policy

Standard Oil Co.
(Indiana)
910 South Michigan Ave.
Chicago 80, Ill.

Our company does not have a written policy specifically regarding air pollution control. However, we do follow a platform which includes the statement: "We try to operate in the best interest of share owners, employees, customers, and the public".

Our investment of substantial amounts in equipment designed primarily for pollution abatement is one indication of our effort to carry out the section of that platform concerned with the best interest of the public.

Refinery air pollution problems are considered individually either when facilities are being planned or when a new problem arises.

Several years ago we constructed at our Whiting, Ind. refinery facilities for removing hydrogen sulfide from refinery gases and for converting that hydrogen sulfide into elemental sulfur. Those facilities are producing approximately 60 tons per day of sulfur which would otherwise pollute the atmosphere after being burned along with fuel gas to form sulfur dioxide.

More recently we have constructed facilities which have successfully overcome the nuisance created by obnoxious fumes which are evolved during the oxidation of asphalts.

Other measures taken which have reduced air pollution from our refineries include addition of electrostatic sludge treating methods in connection with the acid treating of naphthas, light distillates, and lube and white oils. Earlier treating methods had created atmospheric pollution.

As you are probably aware, gasoline and other light petroleum products evaporate slowly during storage unless precautions are taken. Besides constituting an economic loss, the vapors are a form of pollution.

This evaporation can be minimized by the use of specially designed storage equipment, such as floating roof tanks, spheres and cylinders for pressure storage, refrigerated storage and tanks with expandable vapor capacity to retain gases. Such special equipment is in use throughout the petroleum industry and, of course, has been installed in our own refineries.

We have also constructed a carbon monoxide boiler to utilize flue gas from one of our larger catalytic cracking units. Although that boiler has proved to be profitable because of the steam produced by burning gas which had formerly been rejected directly to the atmosphere, it also removes traces of unburned hydrocarbons, thus contributing to air pollution control.

The examples cited above are some of the methods we use to control air pollution.

Very truly yours,
S. A. Montgomery, Vice President
Manufacturing Dept.

●

Kaiser Aluminum & Chemical Corp.
Chalmette Works
P. O. Box 1600
Chalmette, La.

Although there is no formal written policy available, there are operating policies and procedures governing air pollution control contained in internal memoranda. These memoranda are primarily for the direction of the individual plant managers whose responsibility it is to maintain the best air pollution control at their respective locations.

In the administrative arrangement under which we operate, I have the staff responsibility of coordinating the activities directed at the control of pollution at all plants in the metals division.

The result of such an arrangement is that our air pollution control policy is a cooperative undertaking, using the best thinking of specialists in the fields of plant operations, engineering, public affairs, and law, and which makes allowances for local conditions.

Very truly yours,
J. C. Schwegmann, Ph.D.
Coordinator, Air Control Activities

●

General Electric Co.
Appliance Park
Louisville 1, Ky.

General Electric Appliance Park Louisville, Ky., is an example of keen interest on the part of top management with reference to air pollution control.

This mammoth plant, the home of General Electric Major Appliance Div., is one of the largest industrial facilities in the country designed around the "Park" concept.

From the time of initial construction, air pollution control equipment was utilized with heavy emphasis to protect both in-plant operations and community environment . . . for example, boilers equipped with both mechanical and electrostatic dust collectors, air scrubbers on process exhausts, filters on air handling systems, plus very extensive lawn and plantings over carefully planned yard and ground areas.

This action was justified by reason of the company philosophy that large industrial plants can locate in residential areas without generating adverse conditions and that the use of large-scale landscaping installations can even be justified to the point where the community appearance is improved.

Our General Electric Co. management at Appliance Park believes that air pollution control is of major importance throughout the nation. Industry should endeavor to take an active part in the development of adequate practical regulations, because voluntary

compliance will prove to be of greatest mutual benefit insofar as industry-community relations are concerned.

John Vonderheide
Manager-Plant Engineering

●

Stauffer Chemical Co.
380 Madison Avenue
New York 17, N. Y.

While not reduced to writing, this company has a firm policy on air pollution control. It has existed for a number of years and every engineer and production supervisor is well aware of it.

In existing plants, control of air and water pollution is regarded as just one of local management's many responsibilities. Like safety or cost control the manager is required to operate his facility in such a fashion that air pollution is minimized and neighbors not offended.

When new plants are authorized, board of directors' approval is not given until the engineering department certifies that no pollution problem will result.

Top management expects and requires line management to observe this policy.

Very truly yours,
M. V. Anthony, Assistant to
Vice President-Production
Industrial Chemicals Div.

●

Gulf Oil Corp.
Manufacturing Dept.
Gulf Building
Pittsburgh 30, Pa.

In response to your first specific question, I must advise that our company does not have "a written policy on air pollution control which applies across the board to all of its plants throughout the country". Accordingly, of course, no copy of any such written policy is enclosed.

The absence of a written policy regarding air pollution control, however, certainly does not mean that we have any lack of interest in the subject. We are well aware that air pollution and its abatement by our industry as well as others is a matter of great and increasing importance to which top management, middle management, and the entire organization must give appropriate attention.

Our approach to the problem is that it is primarily the responsibility of the local management in each of the areas where we have plants. We feel that air pollution control in general is fundamentally a local matter because of the tremendous differences in meteorology, industrial concentration, atmospheric requirements, and other factors which exist in different communities.

Accordingly, we have consistently opposed efforts to impose general air pollution control regulations over wide areas simply because control regulations which would be adequate in one community might very well be too stringent in other places and not restrictive enough in still others.

Our instructions to our refinery managers as to their responsibility for air pollution control have been general but definite. While, as noted above, we have no formal policy directive, the refinery general managers, without exception, understand that it is part of their responsibility to maintain air pollution at the lowest possible level and to cooperate with local air pollution control agencies to the maximum feasible extent.

In addition to local efforts directed toward air pollution abatement, our company has for a long time been very active in air pollution research, both in our own laboratories and as a part of the industry effort in this area sponsored through the American Petroleum Institute.

You may be aware that this latter API program has been under way now for some seven years, and well over $1,250,000 has been spent in this effort. It has yielded a great deal of important fundamental information regarding the chemistry of the atmosphere, and we feel it has resulted in a much better understanding of some of the problems involved in air pollution than has ever been available before through company support of this work, and through the active participation of a number of our management people, we have actively been a part of this program.

In summary, our company is well aware of its responsibilities as an industrial citizen of a number of communities in reducing air pollution to a minimum consistent with continued economic progress. We are determined to continue to demonstrate that we are good neighbors and to participate to the fullest reasonable extent in sound and reasonable efforts toward avoiding unnecessary pollution of our atmosphere.

We salute and welcome articles, such as I presume yours will be, calling attention to the fact that industry has an important role to play in this important area and by and large has been playing it pretty well.

Very truly yours,
Jerry McAfee
Vice President

●

The B. F. Goodrich Co.
Akron, Ohio

The B. F. Goodrich Co. does not have a written policy regarding air pollution control. The primary responsibility rests with each individual plant management. The Department of Industrial Hygiene and Toxicology, which is a department in the Medical Div., serves in a consulting capacity to each of these plant managements.

We feel that air and stream pollution control is an individual plant matter because of the variety of locations, types of plants and products manufactured. Therefore, we believe this is the only way that air and stream pollution control can be handled in our company.

Very truly yours,
Rex H. Wilson, M.D., F.A.C.P.
Medical Director

●

The Upjohn Co.
Kalamazoo, Mich.

First, an answer to the question "Does your company have a written policy on air pollution control which applies across the board to all of its plants throughout the country", would be as follows: we do not!

Our management approaches each problem on an individual basis. Assignments of responsibility for assessment of the problem, economics, development of corrective procedures, and legal implications are shared by the various divisions of the Company as the need dictates.

In the past, and at present, we are continuously engaged in promoting, establishing, and maintaining excellent community relationships. An attempt is made to correct every problem brought to our attention.

Some of our past work has involved costly revisions to processes in order to abate problems of odor or particulate matter emission. We utilize known engi-

(Please turn to following page)

(Continued from preceding page)

neering principles, sometimes in unique form to accomplish these purposes, and also engage consultants where necessary.

We would refer you to the article "Experiences in Controlling Atmospheric Pollution Encountered in Pharmaceutical Manufacturing Processes," which appeared in the May, 1959 issue of Journal of the Air Pollution Control Association, as an example of the variety of effort expended.

Yours very truly,
Wm. Chas. Johnson
Production Engineer

●

Spencer Chemical Co.
Dwight Building
Kansas City 5, Mo.

Our company does not have a written policy on air pollution control. We have handled each case on an individual basis as it has arisen. Our problems with air pollution have been very minor, as our plants are remotely located away from cities.

We have encountered only one instance of air pollution problems, and this was at our Vicksburg Works where fumes from our ammonium nitrate plant were causing a heavy fog, at times, to drift across the highway. We eliminated this problem by scrubbing the vapors off of these stacks.

Very truly yours,
Ralph D. Miller
Techn. Director
Agricultural Chemicals Div.

●

Allegheny Ludlum Steel Corp.
Executive and General Offices
20th Floor Oliver Building
Pittsburgh 22, Pa.

We do not have a written policy regarding air pollution control. However, our company has been very cognizant of the air pollution control problem, and we are complying with air pollution control regulations of the County of Allegheny, which have been in effect for some years.

In this connection, we have had official representation on committees; and a member of our Engineering Department is chairman of the industry committee studying possible means of compliance with air pollution control relating to electric furnaces in the steel and related industries.

Very truly yours,
S. A. McCaskey, Jr.
Secretary

Tidewater Oil Co.
4201 Wilshire Blvd.
Los Angeles 5, Calif.

We do exercise strict controls on the emission of air pollutants from our facilities. Furthermore, we are constantly studying this problem and control equipment so that we can effect increased collection efficiencies and reduction of air pollution.

We have anticipated the needs for improvements in this field and have taken steps to effect such improvements prior to the enactment of legislation in this regard. Furthermore, we take a very active part in organizations which actively support the principle of reducing air pollution from plant facilities.

Yours very truly,
C. A. Phillips
Administrative Manager of Manufacturing

* * *

Lack of a definite, written policy about air pollution on the part of these large corporations does not mean that air pollution is a neglected subject.

As these letters prove, big industry has long since passed the stage where the general attitude was, as an old-time business tycoon once said: "Let the public be damned."

Public relations is an expense, not easy to justify on grounds of direct economic return. Purchase of air cleaning equipment to end air pollution may also be hard to justify because it, like public relations, does not make the product cheaper, faster, or better.

But also like public relations, air cleaning equipment can improve the industrial climate in which the product is made. So in the long run it enhances public acceptance of the product.

Reverse Jet Filter Pays for Itself In Gold!

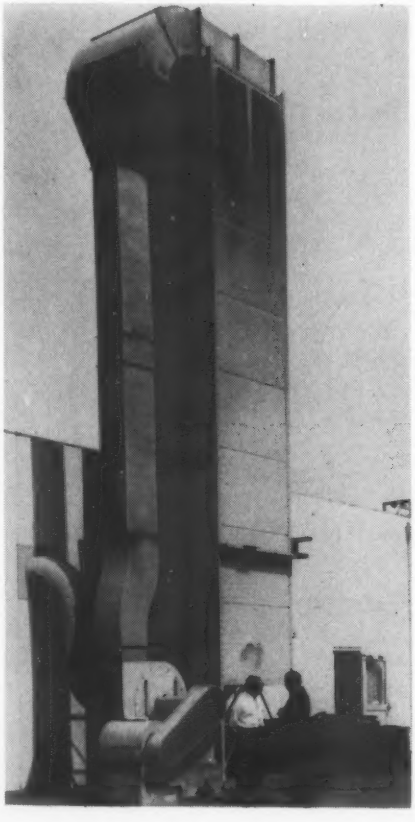
GOLD DUST IS FOUND AND COLLECTED every day out of the air at El Monte, Calif.

Handy & Harman Co., which manufactures gold and silver alloy wire, sheet, special forms, jewelers findings, etc. for the jewelry and electronic fields, performs the trick.

In melting and alloying precious metals, as well as cutting, sawing, and forming them, certain amounts escape into the air in gases and as dust.

For this reason, all of the gases and air from the plant are filtered through a reverse jet filter. The company has had the filter for five years without servicing. It is still using the original filter bags.

Recovery of valuable materials by itself paid for the unit within two years. ▲▲



Thomas A. DeVore (l.), superintendent at Handy & Harman, discusses gold-collecting filter with Dave Perlis, product sales manager at Western Precipitation Corp.

EQUIPMENT INSTALLED
Dualaire reverse jet filter:
Western Precipitation Corp.

Better Air for Industry

PART I

by Richard V. Sloan, *Senior Engineer*
American Air Filter Co.
Los Angeles, Calif.

Beginning a four-part series on industrial dust collection and air filtration systems emphasizing operation, application, and effectiveness.

AIR CLEANING DEVICES ARE USUALLY divided into two types of systems:

1. Dust Collectors
2. Air Filters

Their use is based on the quantity of material to be removed from the air stream.

DUST COLLECTORS are designed for heavy loads from industrial processes where the air or gas to be cleaned originates in local exhaust systems or process stack gas effluents.

Concentrations will range from 0.1 to 20 grains or more per cu ft. Loadings, therefore, are about 100 to 20,000 times the loadings for which air filters are designed.

Where the air stream is used to convey materials, such as in low pressure conveying systems, pulverizer circuits, and secondary dust circuits of dust collectors, the dust concentrations can range up to 500 grains per cu ft.

AIR FILTERS, on the other hand, remove light concentration of solids found in outside air and in general air supply systems for heating, ventilating, and air conditioning. Dust loadings are usually 1 grain per 1000 cu ft or less. They seldom exceed 4 grains per 1000 cu ft.

In discussing operation, application, and effectiveness of dust collection equipment, it is first necessary to outline some of the reasons for installing it. They are:

Electric melting furnace is one example of a nuisance application where dust collection is highly desirable. This furnace is equipped with reverse jet, bag type collectors.

Damage or Nuisance

Process dust, discharged to atmosphere from stacks not equipped with effective air cleaning devices, permits coarser particles to settle in the general area of the stack. Such settlement can be a nuisance to neighborhood property and many times actually cause damage from oxidation or chemical attack. Finer particles stay in suspension for prolonged periods of time, contributing to the air pollution problems of the community.

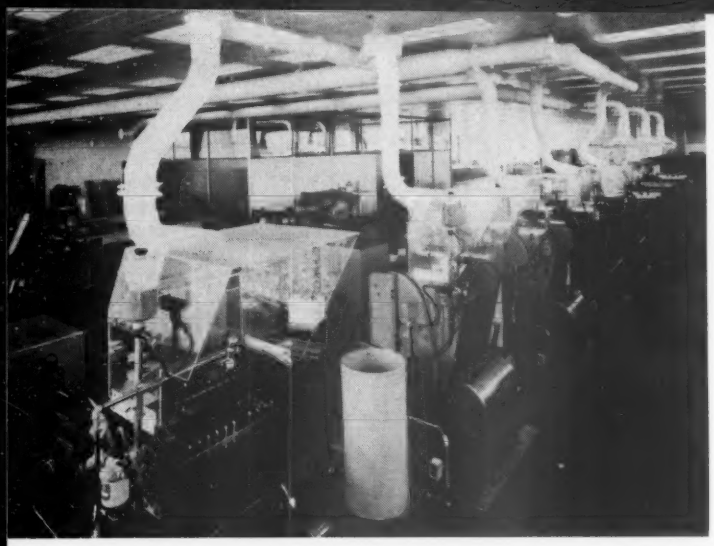
The foundry cupola and the stoker-fired boiler are examples of coarse emissions in quantities such that settled materials on plant roofs can cause endless maintenance in material removal and roof repair.

The aggregate dryer, the cement kiln, and the pulverized fuel boiler discharge loadings that settle in a decreasing volume over an extended area from the point of emission.

Exhaust of ferrous grinding, heat treat furnaces, plating and caustic tanks discharge materials that can damage the finish of automobiles.

Sub micron particles, such as zinc oxide and ferrous oxide from melting operations, are typical of stack effluents that tend to stay in suspension for long periods causing (1) the smogs that reduce visibility and (2) shut out sunlight where meteorological conditions prevent their dispersion to the conisphere. The conisphere is the outer layer in the atmosphere marking the limit of dispersed particles that deflect sunlight.

(Please turn to following page)



Removing ink mist from offset presses is an example of the need for collection equipment to eliminate toxic particles from workroom air.

(Continued from preceding page)

Clean Workroom Air

Air cleaning equipment will prevent re-entry of contaminants from exhaust systems back to the workroom air. Without collectors, discharged contaminants can be swirled from exhaust stacks back to the workroom through open windows and doors, or they can be picked up by fresh air supply and make-up air systems.

Reclamation of Materials

Salvable material collected by air cleaning equipment may be a major reason for dust collector installation. In some cases, such as manufacture of carbon black, sintering and roasting of lead ores, and pulverizing of chemicals, the dust collector is an important piece of equipment essential to the efficient operation of the manufacturing process.

Many fine materials are conveyed by air through duct systems using the air stream as the transport media. Collectors are an essential element in such systems which are used extensively in the textile, grain, food processing, and chemical industries.

In other groups of operations such as collection of flour dust in bakeries, brass grinding dust in metal finishing, ore dust from crushing and milling, lime dust from kilns, and sugar dust from dryers and coolers, cost of air cleaning equipment will be paid for from salvaged material even though a basic reason for the installation is prevention of a nuisance problem to the plant and its neighborhood.

Control Fire or Explosion Hazards

Collection of fine dust, especially from organic materials, can eliminate fire hazards introduced by settled material discharged from exhaust systems controlling such items. Collectors removing coal dust, wood sander dust, grain dust, and oil fumes are examples.

Danger from fine explosive dusts can also be reduced by using a dust collector of a design that type dust collectors have been used extensively for this purpose in the manufacture of explosives and in collection of magnesium, titanium, and aluminum.

Reduce Employe Exposure

In the use of exhaust systems the large quantities of air removed from the work area will reduce the contact time with the employe handling toxic dusts, but only if hooding and collectors are adequate and planned according to state codes which have been tested many times over.

Selection of Dust Collecting Equipment

Dust collection equipment is available in numerous designs utilizing a number of principles, and featuring wide variation in effectiveness, first cost, operating and maintenance cost, space, arrangement, and materials of construction.

Consultation with the equipment manufacturer is the recommended procedure in selecting a collector for any problem where extensive previous plant experience on that specific dust problem is not available.

Concentration and Particle Size

Contaminants in exhaust systems cover an extreme range in loadings and particle size. Concentrations can range from 0.1 to 20.0 or more grains per cu. ft. In low pressure conveying systems, usual concentrations will be as high as 150 grains per cu ft.

Mean particle size of industrial contaminants range from 0.5 to 100 or more microns. Deviation from mean size (the range of over and under the mean) will also vary with the material. Such indication of the mean particle size and deviation of typical contaminants has been included in the Sylvan chart.

Degree of Collection Required

A basic decision must be made concerning type of collector needed to do a satisfactory cleaning job for the specific problem under consideration.

Evaluation will consider need for high efficiency, high cost equipment like electrostatic precipitators or wet Venturi-type collectors, high efficiency moderate cost equipment like fabric or wet collector units, and the lower cost primary units like the dry centrifugal group.

If either of the first two groups are indicated, the question of combination with primary collectors should be weighed.

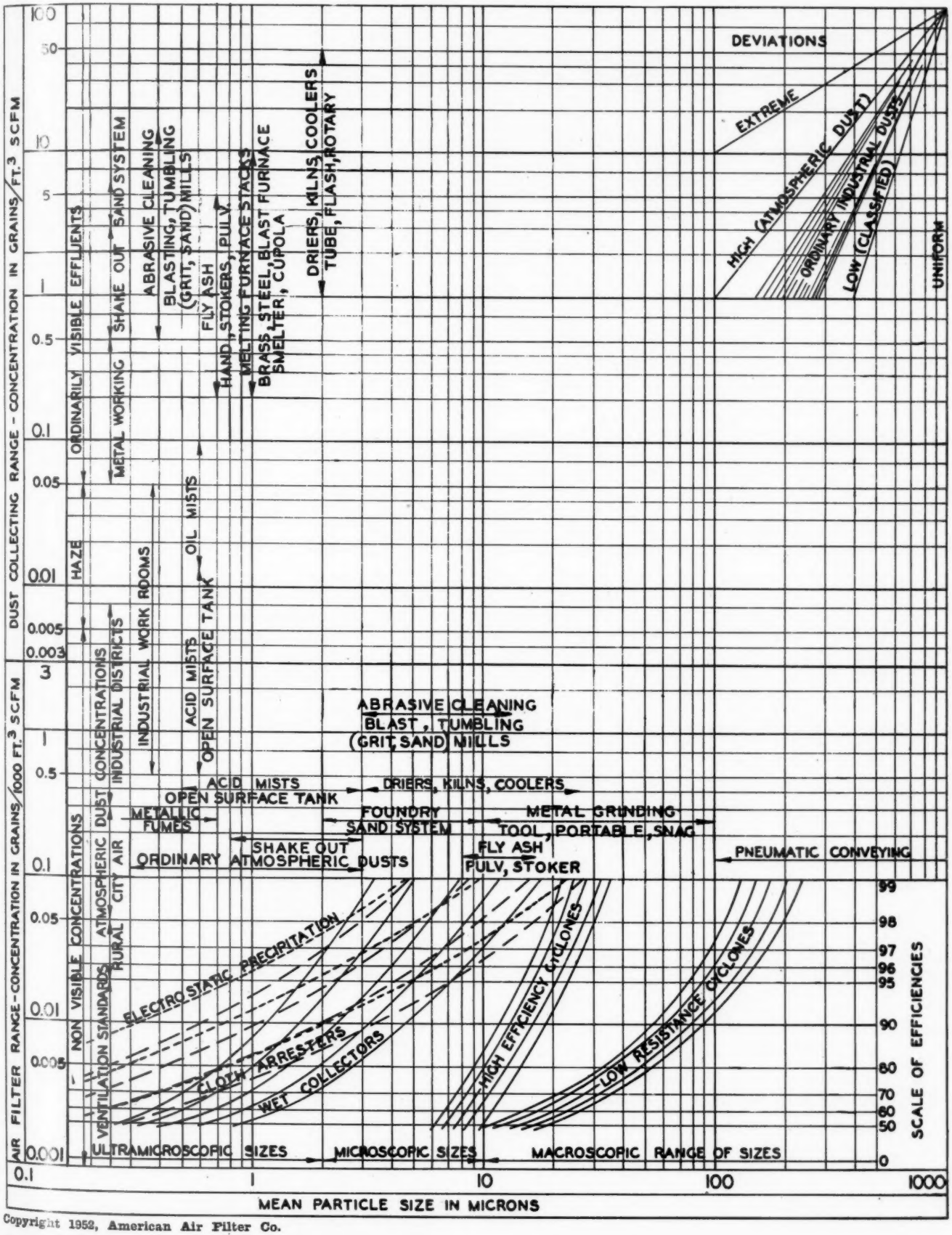
Collection efficiency will depend on plant location, comparison of quantities of material released to atmosphere with different types of collection, nature of contaminant and its salvage value, or contaminant's potential as a health hazard or ability to damage property.

For most contaminants, a plant located so that it is remote from other industries or residential areas need not select equipment with as high a degree of removal as a plant not so fortunately located.

(Please turn to page 44)

Range of Particle Sizes, Concentration, & Collector Performance

Compiled by S. Sylvan



Copyright 1952, American Air Filter Co.

Acknowledgements of partial sources of data reported:

Frank, W. G., American Air Filter Co., *Size and Characteristics of Airborne Solids*, 1931.

First and Drinker, *Archives of Industrial Hygiene and Occupational Medicine*, April, 1952.

(Continued from page 42)

Even for such remote locations, damage to farms or contribution to air pollution problems of remote cities can indicate need and importance for effective collection equipment.

Many an industry originally away from residential areas failed to anticipate the influx of residential building prompted by the plant itself. Such errors have accounted for the purchase of improved dust collecting devices by many a cement mill, coal mine, and other remotely located plants.

With the trend toward stricter air pollution codes, considerable thought should be given to installation of equipment which will give the highest degree of cleaning efficiency.

With the emphasis on public nuisance and air pollution from stack effluents, a plant can now expect the same public criticism for excessive emissions whether located in a heavy industrial section of the city or in an area closer to residential zones.

Quantity of escapement (mass rate of emission) will also influence type of collection equipment selected. For a given concentration, the larger the exhaust volume, the greater the need for better collection equipment. Large central steam generating stations will select high efficiency electric precipitators for their pulverized coal boiler stacks.

An industrial pulverized fuel boiler could use lower efficiency dry centrifugals and still discharge to atmosphere only a fraction of the pounds escaping much larger gas volumes of central station stacks.

For a given dust loading, a collector of 50 percent efficiency cleaning a volume of 1000 cfm would not discharge any more pounds of material to the atmosphere (although the mean particle size of discharge dust would be larger) than a collector with 90 percent efficiency cleaning a volume of 5,000 cfm (mean particle size, however, would be much smaller).

Safe Recommendation

One safe recommendation in equipment selection can be summed up as: Select the collector that will allow the least possible amount of contaminant to escape and still be reasonable in first cost and maintenance. For some applications, even the question of reasonable cost and reasonable maintenance must be sacrificed to meet established standards for air pollution control or prevent health or property damage.

It must be remembered that visibility of an effluent will be a function of the light reflecting surface area of the escaping material. Surface area per pounds increases roughly as the square of particle size, which means that the removal of 80 to 90 percent of a dust load can remove the coarse particles without altering the stack discharge appearance.

It is also difficult to compare efficiency claims of manufacturers in a given group of collectors. The absence of a standard method of small micron particle measurement can result in a variation in performance reported, dependent on measurement equipment used.

Characteristics of Air or Gas Stream

Characteristics of the carrier gas stream can have a marked bearing on equipment selection. High temperature gas streams exceeding 180F will prevent use of standard cotton media in fabric collectors. Presence of steam or condensation of water vapor will cause packing and plugging of air or dust passages in fabric and dry centrifugal collectors. Chemical composition causes extremely corrosive conditions when mixed with water in wet type collectors.

Characteristics of Contaminant

Contaminant characteristics will also affect equipment selection. Chemical composition can cause attack on collector elements or corrosion in wet type collectors.

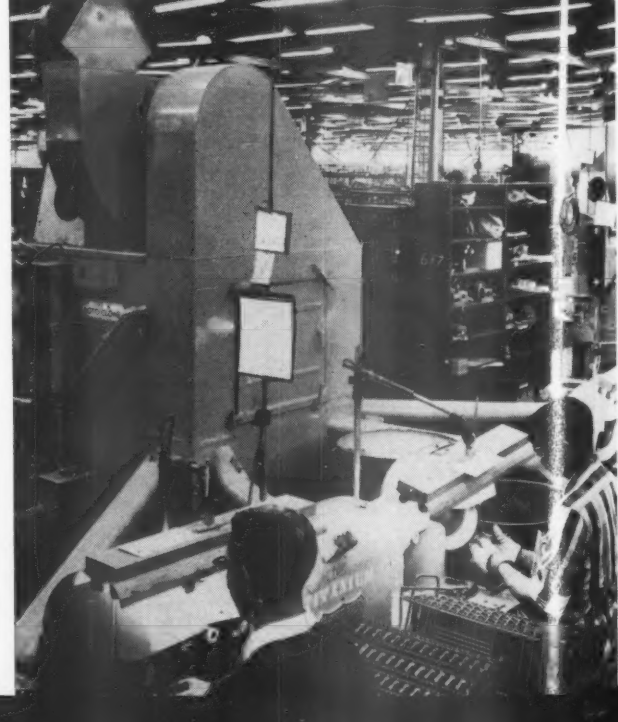
Sticky materials like metallic buffing dust impregnated with buffing compounds can adhere to collector elements, plugging collector passages. Linty materials like dust from textile openers, pickers, and nappers will adhere to certain types of collector surfaces or elements.

Abrasiveness of many materials in moderate to heavy concentrations, like dust from sand blasting, will cause rapid wear particularly on dry type centrifugal collectors. Particle size and shape will rule out certain collector designs. The large size of some woodworking splinters and shavings, plus refuse from floor sweeps, could plug collector air or dust passages of some designs.

The parachute shape of particles like "bees wings"

(Please turn to page 51)

Collecting titanium buffing exhaust, an orifice type collector returns clean air to the workroom and eliminates explosion hazard.

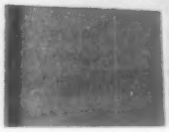


Specifications:

Closed, Open, or Base Bid?

What challenge does each offer to the conscientious specifications writer? How can he best meet the needs of his client—and still take full advantage of competition?

by M. J. Horsch
Chief Specifications Writer
Giffels and Rossetti



ONE OF THE MORE IMPORTANT FUNCTIONS of contract specifications is to guarantee that the materials and equipment which are used by the contractor fully meet the requirements of the design intent.

This implies unmistakably clear definition of these requirements, in terms which will enable the bidder to be sure that the materials upon which he bases his bid meet these requirements, and which will enable the engineer to determine whether or not the contractor's materials conform.

If the Owner for whom the work is to be done should not wish to seek price advantage in the competitive market, the specification writer would need only to name the one material which he regards as the best suited to the specific requirements, and make it clear that no other is acceptable. There can then be no question in the mind of the bidder as to what is required, and the engineer has no problem of comparing one material with another against defensible evaluative criteria. This is the essence of the closed specification.

While an occasional Owner prefers, or approves, the use of closed specifications, the great majority of Owners prefer to make the fullest use of the competitive market, consistent with the requirements of design. The use of a closed specification when it is the Owner's intent to take full advantage of competition implies that the specification writer be informed on all materials and equipment, and that he knows that only the ones he has designated in the specifications satisfy design requirements.

It is improbable that any specification writer could honestly make a claim to be so universally informed. If there are, or could be, other products which satisfy design requirements, a specification which offered the contractor the right to use whichever of them he could buy to best advantage would produce a lower price than would the closed specification which permits no choice. All of us remember specific instances of the effect of competition in "sharpening the pencils" of bidding contractors and suppliers – and of the price-increasing result of telling the bidder he has no competition.

But while open specifications do result in better prices, they also carry a heavy potential for loss to the Owner. Unless open specifications clearly define the requirements in terms which are understood by the bidder and which provide the basis for the effective evaluation of other products which might be proposed, there is a real danger that design requirements may not be met by the materials used. The loss to the Owner can well be many times the difference in price between materials.

In writing an "open" specification, the writer must therefore be sure that he understands exactly what the minimum design requirements are; he must define them so that all who bid may know and that when he is called upon to evaluate proposed materials, this definition will provide all the criteria for an intelligent, professionally defensible evaluation. This means work and research.

Must Know All Recognized Standards

The specification writer must be thoroughly familiar with all of the recognized standards. He must know what makes the good product better than others. He must understand construction and formulation, measurement and testing procedures, and the techniques for evaluating performance. This calls for a level of technical competency quite above that required for selecting an item from the catalog of a concern we regard as reliable, and specifying this item "closed," safe in the assurance that if anything goes wrong, the manufacturer will fight our battle for us.

Open specifications, which provide the necessary safeguards against the undercutting of design requirements, might take several forms:

(Please turn to following page)

The specifications writer, to retain the dignity of a professional, must design requirement criteria with sufficient exactitude to make them understood by supplier and bidder alike.

(Continued from preceding page)

(1) *Tying back to a standard specification,* such as Federal, ASTM, ASA, or one of the many others now available for a large range of products. Such a specification could include specific modifications of the standard specification to more closely fit the design requirements.

(2) *Carefully describing construction or formulation.* This can be costly if it deviates too far from standard construction or formulation. It can be dangerous, too, in that when we specify exactly how a product is to be made, we shift responsibility for performance from the bidder to ourselves; the writer must be very sure of the design he so specifies.

(3) *Carefully defining minimum performance.* This requires specific performance criteria and valid means for measurement. Where standard measurement techniques have been established by professional societies, trade associations, or governmental agencies, these may be used to advantage. Where such measurement and testing procedures are not available, it often becomes necessary for the specifying engineer to devise practicable testing and measurement procedures.

The bidder should know what the performance criteria are, and by what measurement means his product should be evaluated. Such a specification should make it unmistakably clear that failure of a material to satisfy these performance criteria, even after it has been incorporated into the structure, means automatic disqualification with all the consequences attendant thereto.

(4) *Defining minimum performance, but adding such supplementary construction and formulation requirements as contribute to the definition of design requirements.* A fan specification might well define the requirements as to fan output at the contemplated rotational speed and system static pressure; also the efficiency and the noise limitations; perhaps also the minimum average life factor of the bearings.

But to these performance requirements, the specifying engineer might well wish to add such construction items as metal gauges, finish, lubrication facilities, type of fan wheel, minimum and maximum wheel diameter, etc. These should be realistic requirements, lending themselves to objective determination of compliance.

In this as in the other "open" forms, the work of the bidder and supplier is simplified by the designation of a specific product which meets these requirements. This is accompanied by the words "or approved equal"; the specifications should meticulously explain the words, "or approved equal," as they are there used, together with their intent as used.

(5) *Selecting a product which meets all of the design requirements, and then using it as the standard of compliance therewith.* The wording might be somewhat as follows: "The unit shall be John Doe, Model AX, or an approved equal of similar design and proportions; and of fully comparable capacity, operational efficiency, construction (including materials, metal gauges, and security of fabrication), and workmanship (quality of machining, neatness of fit, and finish)."

This type of specifications approaches the closed specifications in its effect. It does suggest to the supplier of the designated item that he *might* have competition. Unless the criteria of comparison are clearly stated, and unless they are such that they lend themselves to objective determination, it is questionable if this type of specifications can be called "open." At best, it falls far short of the ideal, though it offers some advantages in comparison with a completely closed specifications.

Must Be No Compromise In Conformity

The use of open specifications, if their purpose is to be realized, makes it imperative that there be no compromise, however small, in requiring complete conformity to the requirements as defined in the specifications. Unless all bidders base their bids on the same requirements, the basic purposes of competitive bidding are defeated. *"Almost as good" is never acceptable.*

It is equally important that the necessary steps be taken to guarantee that the materials incorporated into the building comply with the requirements of the specifications. The contractor must be prepared to furnish certified copies of tests conducted by qualified testing laboratories, demonstrating such compliance.

It is also advisable, as a common denominator to the entire project, to retain the right to take samples of the materials being used on the job and send them to a qualified testing laboratory for evaluation against specification requirements. Such samples should be taken in the presence of the contractor's superintendent.

It should be understood that if the materials are

found to be in compliance, the costs of the testing will be borne by the Owner; but if the materials are determined to fall short of specification requirements, the costs of the tests will be borne by the contractor, and the material will be understood to have been disqualified – with all the consequences which disqualification entails.

A third form of specifications – the Base Bid Specifications – has recently become quite popular. This differs from closed specifications only in that it invites the bidder to submit alternate bids on products of other manufacture than those called for in the specifications. This form of specifications has several disadavntages which are often overlooked.

(1) *It destroys the incentive of the bidding contractor to seek out better prices* – to take full advantage of the competitive market. He is expected to reflect in his bid, the price differentials which grow out of such effort, and hence has little to gain by offering alternate bids. This is borne out by the relative infrequency of such alternate proposals under this specifications form.

If, on the other hand, all qualified suppliers know that the bidding contractor is looking for the lowest price, and that he will use the lowest price (on a product which meets design requirements), their prices to him will be competitively realistic. When the base bid specifications is used, supplier activity is concentrated in the engineer's office *prior* to the release of the specifications, rather than being concentrated on the bidding contractor during the bidding period as it should be.

(2) *If, as is sometimes claimed, the "base bid" specifications takes ample advantage of the competitive market, then there must be many alternate bids on every job, for few products are free from real competition.* If this be true, then the engineer finds it necessary to professionally evaluate these proposals in light of the design requirements.

If he is to evaluate professionally, this can be done only with a sound body of valid criteria and professionally acceptable measuring devices and standards. If these are necessary anyhow, why not share them with the bidders during the bidding period, so that "all who run may read," and so that the fullest advantage will be taken of the competitive market, and so that all suppliers and bidding contractors may have the same platform from which to bid?

Certainly, the evaluation of alternates cannot be done behind closed doors, on bases known only to the engineer, with a "none of your business" attitude toward the inquiring bidding supplier – if the process is to claim professional status.

(3) *It opens the door to manipulation of bids by juggling the alternates.* Some important law suits and court decisions – and criminal prosecutions have resulted from this practice. There is the suspicion of such juggling even when the decisions have been scrupulously honest.

(4) *As in the case of the closed specifications, the base bid specifications invites collusion* – and though the vast majority of specifying engineers would refuse to stoop to such invitations, all of us are under suspicion as long as we effectively close our specifications. Some months ago, three representatives of a major equipment manufacturer were discussing the base bid in the presence of the writer. They were asked if they liked the base bid specifications. The reply was "Yes, if our product is the one named."

Asked what their opinion would be if they were *not* named. Their reply is significant, and points up the danger: "We would *see to it* that we are named. After all, we have been in this business for a long time, and are well aware of the facts of life as they are. We would make it our business to learn what is necessary to get into the specifications – and we'd get there." On a base bid specifications it might be worth quite a few thousands of dollars to be named as the "base."

Competent Reps Can Help

We all recognize that the literature and sales representatives of some manufacturers are more helpful than those of others. We all appreciate the contribution which can be made by a technically competent sales representative who knows his product, and how and where it can be used to best advantage.

Such a representative knows the limitations of his product as well, and is as much concerned that it is not used where it cannot distinguish itself, as that it *be* used where it will perform conspicuously well.

All else being equal (price, conformity to design requirements, etc.) the product of such a representative can well be shown preference in the decisions which result from the comparison of proposed products.

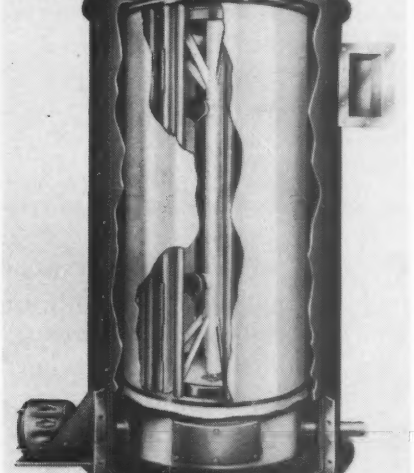
On the other hand, it is our responsibility to refrain from paying (by the manipulation of specifications) a manufacturer's representative for engineering for which we are being paid by our client, or using the manipulation of specifications to a representative's advantage in repayment for any other favor. Closed or base bid specifications make such practices so easy!

We all would welcome an easy answer to our problems. When someone appears on the horizon and casts an aura of professional dignity about a short cut which our professional consciences forbade, it is quite normal to join in the acclaim of the easy way out. But, unfortunately, some of our most important responsibilities as professionals have no easy avenue of discharge.

The highest level of technical competency, vigorously and untiringly applied to the problem, is the

(Please turn to page 51)

New PRODUCTS



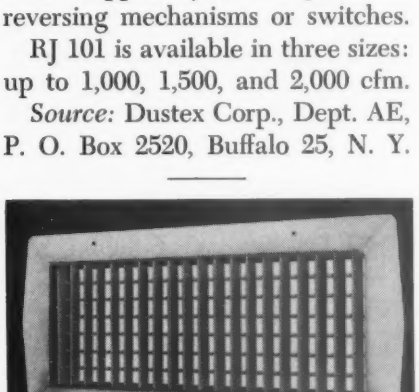
Cloth Dust Collector

Purpose: Dust collection.

Features: New design that imparts centrifugal action to dust upon entering collector, separating much of dust before it ever reaches the cloth. Rotating blow tube and roller support system requires no reversing mechanisms or switches.

RJ 101 is available in three sizes: up to 1,000, 1,500, and 2,000 cfm.

Source: Dustex Corp., Dept. AE, P. O. Box 2520, Buffalo 25, N. Y.



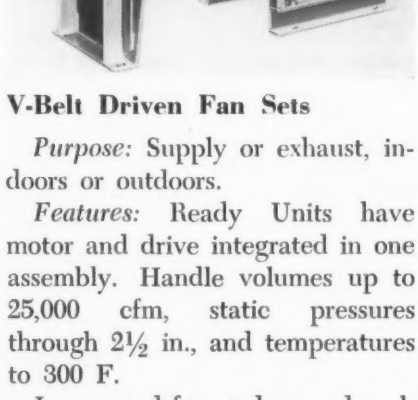
Nylon Injection Molded Registers and Grilles

Purpose: Grilles, registers, and curved blade diffusers for sidewall and ceiling air distribution.

Features: Injection molded of high density nylon that permits higher jet velocities without whistling or roaring. Built-in double "Air-Loc" provides permanent air-tight closure against wall or ceiling without use of gaskets.

Heat resistant to 300 F, guaranteed distortion free at elevated temperatures. Non-corrosive and does not sweat. Virtually static free.

Source: AirGuide Plastics Corp., Dept. AE, 20 S. E. Third Ave., Miami 32, Fla.



V-Belt Driven Fan Sets

Purpose: Supply or exhaust, indoors or outdoors.

Features: Ready Units have motor and drive integrated in one assembly. Handle volumes up to 25,000 cfm, static pressures through 2½ in., and temperatures to 300 F.

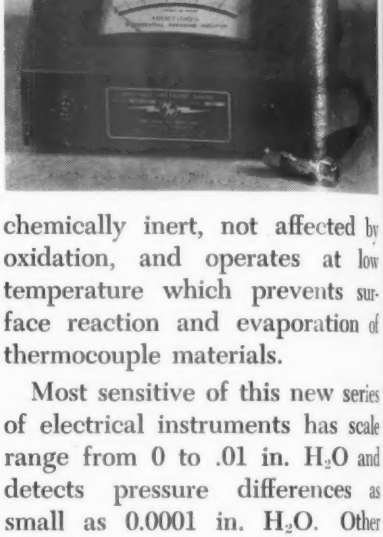
Low speed forward curved multiblade wheels are offered in 13 sizes; medium speed backward inclined blade wheels in 12 sizes. Motor, drive, and bearings completely accessible. Entire drive within frame of unit.

Source: Clarage Fan Co., Dept. AE, Kalamazoo, Mich.

Electrical Differential Pressure Gauges

Purpose: Accurate determination of differential pressure of air and other gases. Can be used as draft gauges, remote electrical flowmeter, etc.

Features: Sensing device is a noble metal thermopile installed in a flow tube. Thermopile is



chemically inert, not affected by oxidation, and operates at low temperature which prevents surface reaction and evaporation of thermocouple materials.

Most sensitive of this new series of electrical instruments has scale range from 0 to .01 in. H_2O and detects pressure differences as small as 0.0001 in. H_2O. Other models range up to 100 in. H_2O

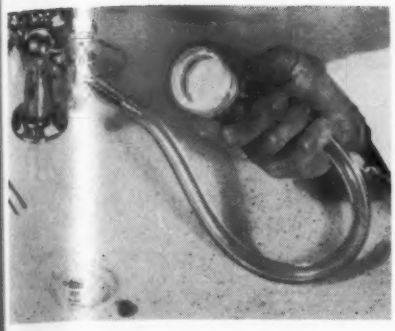
Source: Hastings-Raydist, Inc., Dept. AE, Hampton, Va.

Remote Heat Pump

Purpose: Heating and cooling business establishments and homes.

Features: Air-to-air heat exchange in 3 and 5 hp models. Consists of outdoor compressor assembly, indoor coil and air handling unit, and optional supplementary electric resistance heating packages. Indoor unit can be suspended. Heating packages available in 8 and 12 kw delivering 27,280 and 40,920 Btuh. Heating elements sequenced through control panel which energizes them in 4 kw increments.

Source: Mueller Climatrol, Div. of Worthington Corp., Dept. AE, 2005 West Oklahoma Ave., Milwaukee 1.



Aerosol Sampling Device

Purpose: To collect airborne particles on a Millipore filter for sampling air in clean rooms, breweries, food plants, and nuclear installations.

Features: Aerosol monitor containing a Millipore filter disc requires only a set of limiting orifices and an aerosol adapter to connect it to a source of vacuum and it is ready for use.

Monitors are of disposable, open type, molded of non-inhibitory polystyrene. Since filter surface is exposed only at moment of use, background counts are held to minimum.

Source: Millipore Filter Corp., Dept. AE, Bedford, Mass.

Industrial Fan Series 400

Purpose: Handling granular, abrasive, and fibrous materials, dust collection, fume and high temperature exhaust.

Features: New open type material wheel is constructed of flat radial blades. Backplate material wheel is also available for handling stringy or slugging materials. Has streamline inlet to reduce air and material shock.

Also available with wheel using backwardly inclined blading for handling clean air, fumes, and very light industrial dust.

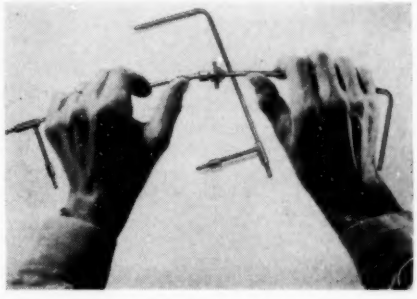
Source: Westinghouse Sturtevant Div., Dept. T-000-AE, 200 Readville St., Hyde Park, Boston 36, Mass.

Use Communications Center, page 35, for requesting more information about articles, advertised products, literature, etc.

Pocket Size Pitot Tubes

Purpose: Measure flow in pipes of 4 in. dia or less down to ½ in. dia and in any duct where less than 12 in. insertion is required.

Features: Have OD of ⅛ in.



and overall lengths of 6 to 12 in. Because of spring-like quality of hypodermic needle grade stainless steel used, tubes may be flexed without damage and may be used in temperatures up to 800 F. All joints are silver soldered. Special extreme temperature types are available.

Source: F. W. Dwyer Mfg. Co., Dept. AG-8-AE, P. O. Box 373, Michigan City, Ind.

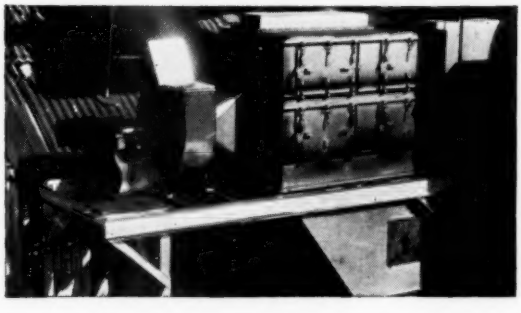
Reinforced Plastic Humidifier

Purpose: For use in return air duct of warm air furnaces, industrial, and commercial applications.

Features: Made of reinforced plastic. Weighs only 2 lbs. 12 in. dia. and 12 in. high. Capacity ranges from ½ to 3½ gph.

Source: Kauffman Air Conditioning Co., Dept. AE, 4336 W. Pine Blvd., St. Louis, Mo.

(Please turn to following page)



Barely visible discharge from exhauster in this unretouched photo shows how Dustex Miniature Cyclone Collector ended a problem for Perlite Products Co.—while recovering 70 lbs./hr. with no maintenance.

"95% PREDICTED EFFICIENCY PROVED . . .

and Collector is maintenance-free!" . . . at Perlite Products Company

Frank W. Shaffer, President of Perlite Products Co., Primos, Pa., writes this about his Dustex Miniature Cyclone Collector purchased on a basis of the Dustex Single Tube Determination test:

"Your predicted efficiencies of 95% are proven . . . collecting 70 lbs./hr. of 85% below-325-mesh material at 450°F . . . complaints on discharge are ended, and the collector is maintenance-free."

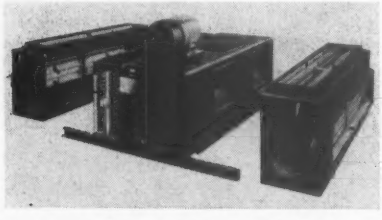
Write Today for Dustex Bulletin "A Simplified Test Method" describing actual collection test at your plant at no obligation.

25 ANDERSON ROAD • BUFFALO 25, N.Y.

dustex CORP.

New PRODUCTS

(Continued from preceding page)

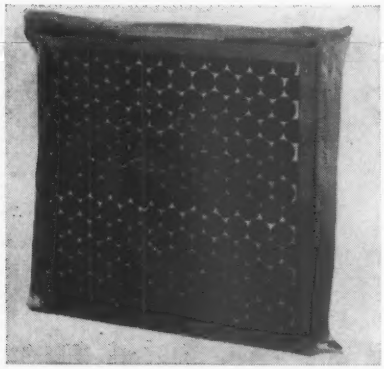


Blower Type Air Cooled Condenser

Purpose: "AL" Aircon combines refrigerant condensing with heating and ventilating. Can also be used for secondary purpose of exhaust ventilation and/or heating and ventilating.

Features: Utilizes rejected condenser heat for heating and ventilating. Available in eight different unit arrangements with capacities from 10 to 50 tons. Largest model less than 4½ ft. high.

Source: McQuay, Inc., Dept. AE, 1600 Broadway St., N.E., Minneapolis 13.



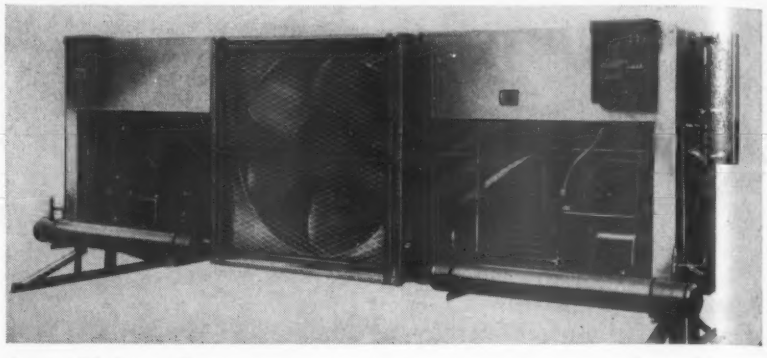
Disposable Odor Filter

Purpose: For use in almost any situation where contaminants in vapor form should be removed from enclosed space.

Features: AAF odor filters combine odor removal by activated carbon adsorption with air cleaning. Require no reactivation. Carbon filters are produced around a synthetic core incorporating a strong filament body.

Offered in four standard sizes in 2 in. frames.

Source: American Air Filter Co., Inc., Dept. AE, 215 Central Ave., Louisville 8, Ky.



Outdoor Unicon-Compressor

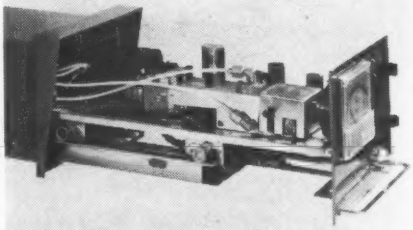
Purpose: Outdoor installation of complete air conditioning high side.

Features: Requires only electrical supply and connections between Unicon-compressor and evaporator to operate. Factory tested.

All standard servicing components are accessible on outside of unit, including electrical controls, pressure gauge valves for suction and discharge, receiver inlet and outlet valves, purge valve, and liquid sight glass.

Can be furnished with built-in Winterstat for cold weather operation. Low silhouette and aluminum casing.

Source: Kramer Trenton Co., Dept. AE, Olden & Breunig Ave., Trenton 5, N. J.



Portable Infrared Analyzer

Purpose: For faster, more flexible application in measurement of gases, vapors, and liquids in industrial process streams and atmospheres when moderately priced instrumentation is required.

Features: Model 300 LIRA analyzer weighs 30 lbs. and is housed in case 8 in. high and wide and 19 in. long. Mounted on single tray which may be rolled completely out of case for maintenance and servicing. Can be calibrated in very narrow or very broad ranges.

Source: Mine Safety Appliances Co., Dept. AE, 201 N. Braddock Ave., Pittsburgh 8.

Use Communications Center, page 35, for requesting more information about articles, advertised products, literature, etc.

Safety Face Shield

Purpose: Protect faces of industrial workers in heated areas where both visibility and protection is required.

Features: Incorporates optically correct acetate window in fine metal 24 mesh screen 8 in. by 11½ in. Secured by adjustable fibre headband so shield can be worn with or without eyeglasses. Windows available in clear, green, or aluminized.

Source: American Optical Co., Dept. AE, Southbridge, Mass.

Better Air for Industry

(Continued from page 44)

from grain will "float" through centrifugal collectors because their velocity of fall is slower than much smaller spherical particles of the same specific gravity. Combustible nature of many finely divided materials will influence selection of safe types of collectors for such products.

Method of Disposal

Methods of removal and disposal of collected materials will vary with the material, plant process, quantity involved, and collector design. Dry collectors are unloaded continuously or in batches through dump gates, trickle valves, and rotary locks to conveyors or containers.

Dry materials can create a secondary dust problem where careful thought is not given to dust-free material disposal or to collector dust bin locations suited to convenient material removal. Wet collectors are arranged for batch removal or continual ejection of dewatered material by flight conveyors or draining as a slurry.

Secondary dust problems are eliminated, although disposal of wet sludge can be a material handling problem. Solids carry-over in waste water can create a sewer or stream pollution problem if waste water is not properly clarified.

Material characteristics can influence disposal problems. Packing and bridging of dry materials in dust hoppers, floating or slurry forming characteristics in wet collectors are examples of problems that can be met.

Next month, Part II of this article will take up types and applications of air cleaning equipment. Part III, in February, will discuss costs in terms of equipment, installation, operation, maintenance, and capacity. It will also contain a handy check list of Do's and Dont's in selection and application of air cleaning equipment. Part IV, in March, will cover air cleaning in air conditioning, heating, and ventilating systems. ▲▲

REFERENCES

1. Kane, John M. "Operation, Application & Effectiveness of Dust Collection Equipment." AAF Bulletin 270-P2. American Air Filter Co., Inc.

2. "American Air Filters In Industry." American Air Filter Co., Inc.

3. "Design of Roto-Cone Dust Control System." American Air Filter Co., Inc.

Reverse Jet Filters Back Down Dust

(Continued from page 26)

through the tube to dislodge the collected dust. The filter rings, with adjustable tension springs and bellows-type rubber air connectors, adjust automatically to the contours of the filter tubes. They travel up and down the tubes thus removing trapped dust from the entire length of each tube.

With this filter, a constant air volume is maintained and back pressures remain relatively uniform. There are no sudden surges or drops to affect the overall system efficiency. As high pressure, reverse-air dislodges dust from felt tube it settles to the bottom of the filtering unit and is carried away by the screw-type conveyor, rotary valve, or a hopper, depending upon the installation.

Cleaning efficiency of the reverse jet dust filter measures as high as 99.99+ percent.

This spring and summer – at the time of year when complaints by neighbors used to be heaviest – not a single complaint was registered.

"Since our new filter system was put into operation," the elevator superintendent said, "we haven't had one complaint. Loading areas are always free of dust, and when loading into cars from dust bins (a particularly dusty operation) the surrounding air actually remains clear." ▲▲

Specifications . . . Closed, Open, or Base Bid?

(Continued from page 47)

only reliable formula for discharging such responsibilities; and the writing of specifications seems to be one of the areas in which this formula is especially applicable.

If the writing of specifications is to retain the dignity of a profession, it will be because ever more writers inform themselves well enough, and determine the design requirement criteria with sufficient exactitude to make them understood by supplier and bidder alike – and incorporate them in such a form in the specifications.

Intelligent clients will know that they have employed competent engineers. The urge on the part of the few unscrupulous suppliers and contractors to "chisel" will be sharply reduced. The profession will have lifted itself above the suspicions which attend some of today's practices; and the writers will ever be developing into better engineers. No, it isn't easy, but it's well worth its price. ▲▲

Next month: We asked leading architects, consulting engineers, general contractors, mechanical contractors, and owners for their opinion of Mr. Horch's thesis. These replies will be published in January.

INDEX OF ADVERTISERS

Aerovent Fan Co., Inc. 6
Agency: Mariva Industrial Advertising

American Air Filter Co., Inc. ..... *
Agency: Doe-Anderson Advertising Agency

Barber-Colman Co. ..... *
Agency: Howard H. Monk & Associates

Barnebey-Cheney Co. ..... *
Agency: Odiorne Industrial Advertising

Buell Engineering Co., Inc. ..... *
Agency: Hicks & Greist, Inc.

Cambridge Filter Corp. 2
Agency: Richards & Webb, Inc.

Carrier Corp. ..... *
Agency: N. W. Ayer & Son, Inc.

Catalytic Combustion Corp. ..... *

Chemical Construction Corp. ..... *
Agency: Godwin Advertising

Chrysler Corp., Airtemp Div. 7
Agency: Grant Advertising

Day Co. 1
Agency: Scrymiger & Osterholt Advertising

Harry W. Dietert Co. ..... *
Agency: Watkins Rogers, Inc.

Drayer-Hanson Div., Nat'l U. S. Radiator Corp. ..... *
Agency: Lansburgh & Oldham

Ducon Co., Inc. 5
Agency: Sam J. Gallay Advertising

Dustex Corp. 49
Agency: Comstock & Co.

F. W. Dwyer Manufacturing Co. 8
Agency: Symonds, Mackenzie & Co.

Easton R. S. Corp. ..... *
Agency: Advertising Techniques

Flanders Filters, Inc. ..... *
Agency: C. M. Johnson and Associates, Inc.

Flexaust Co. ..... *

Gelman Instrument Co. ..... *
Agency: Watkins Rogers, Inc.

Green Fuel Economizer, Inc. ..... *
Agency: Rose-Martin, Inc.

Hartzell Propeller Fan Co. ..... *
Agency: Kight Advertising

Heil Process Equipment Corp. ..... *
Agency: Henry T. Bourne Adv. Agency

Illinois Testing Laboratories, Inc..... 6
Agency: The Buchen Co.

Jackson & Church Div. of York-Shipley, Inc. ..... *
Agency: Adams Associates, Inc.

Kirk & Blum Mfg. Co. ..... *
Agency: Baer, Kemble & Spicer, Inc.

Lennox Industries, Inc. ..... *
Agency: Fulton, Morrissey Co.

Maxon Premix Burner Co. ..... *
Agency: Poorman, Butler and Associates, Inc.

Metal Textile Corp. ..... *
Agency: Hicks & Greist, Inc.

Mercoid Corp. ..... *

Wm. W. Meyer & Son. Inc. ..... *
Agency: Slauf Advertising

Niagara Blower Co. 15
Agency: Moss-Chase Co.

Reliance Electric & Manufacturing Co. ..... *
Agency: The Wellman Co.

Research-Cottrell, Inc. ..... *
Agency: Michel-Cather, Inc.

Research Products Corp. ..... *
Agency: Ralph Timmons, Inc.

Spraying Systems Co. ..... *
Agency: Advertising Producers Associated

Staplex Co. ..... *
Agency: Lee Keeler, Inc.

Stoddard Industries 4
Agency: The Caples Co.

Torit Manufacturing Co. 52
Agency: Kerker, Peterson, Hixon, Hayes, Inc.

The Trane Co. ..... *
Agency: Campbell-Mithun, Inc.

Western Precipitation Corp. ..... *
Agency: Dozier Eastman & Co.

Westinghouse Electric Co., Sturtevant Div. ..... *
Agency: Fuller & Smith & Ross, Inc.

York Corp., Subs. of Borg-Warner Corp. ..... *
Agency: Keyes, Madden & Jones

*Not advertising in this issue.

PROFESSIONAL SERVICES

LAUREN B. HITCHCOCK ASSOCIATES
Chemical Engineers
Industrial Air Pollution Abatement
L. B. Hitchcock.....Edwin Cox
John H. Schaefer, Technical Advisor
60 East 42nd St., New York 17, N. Y.

CLASSIFIED ADVERTISING

RATES—Classified advertising is run in 6-point type (this size) under suitable headings. Minimum rate $5.00 for forty words or less. Extra words .15 each. Box addresses, with usual services, count as five words. Payment required with order. No agency commission, no checking copies. Closing date first of month preceding month of issue. No proofs will be submitted prior to running, but proof will be forwarded for record. No display advertising under classified headings. AIR ENGINEERING, 450 W. Fort Street, Detroit 26, Mich.

POSITIONS AVAILABLE

AIR POLLUTION TECHNOLOGIST—desire graduate chemist or engineer with experience and training in air pollution or industrial hygiene investigations and control measures. Position requires state-wide travel to assist develop and operate an expanding air pollution and industrial hygiene program. Salary dependent upon experience and education. H. G. Bourne, Jr., OHIO DEPARTMENT OF HEALTH, 306 State Department Building, Columbus 15, Ohio.

Use Communications Center, page 35, for requesting more information about articles, advertised products, literature, etc.

in laying out your client's plant

ARE YOU GUARDING AGAINST DUST DAMAGE TO MACHINES?

Will there be dust-producing machines in your client's new plant? Such as metalworking, wood-working or penumatic conveying equipment? If so, you should plan now for dust control.

Because dust clogs and gums up costly machinery, lowers production efficiency, causes breakdowns and higher maintenance costs. In addition, dust is harmful to the health of employees.

More and more professional men, laying out new plants and remodeling older ones, are specifying Torit Dust Collectors. Torit Dust Collectors have proved 98% efficient in removing dust. They are compact, easy to install and maintain, and cost far less than many types of dust collecting equipment.

Contact a Torit representative. He will give you dust collector specifications, performance charts, dimensional drawings, installation suggestions . . . all the information you need.

Write:

TORIT
MANUFACTURING COMPANY
1133 Rankin St., St. Paul 16, Minn., Dept. 1927

Cyclone model. *Also available in portable cabinet models.*